



HEATING THROUGH FOREST BIOMASS

MOBILIZING COMMUNITIES
IN CHAUDIÈRE-APPALACHES
(QUÉBEC)

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HEATING THROUGH FOREST BIOMASS

BACKGROUND
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Québec stated in its 2030 Energy Policy, that priority will be given to forest biomass as a source of energy, with an increased target of 50 % toward bioenergy production. The 2018-2023 master plan committed a budget of \$136 million for the Residual Forest Biomass Program, which aims to promote the creation of biomass heating systems throughout the province of Québec. In addition, from 2020-2021, heating systems operating on fossil fuels within public buildings will be replaced by systems using renewable energy, such as forest biomass. This process has already been implemented with new public construction projects.

In addition to the government announcements, partners from the political, economic and environmental spheres from different regions of Québec, have chosen to mobilize their communities and carry out necessary measures for forest biomass heating to become a real energy option, contributing to the economic vitality and the efforts to fight climate change in their neighbourhoods. For example, the *Fédération québécoise des municipalités* has spearheaded a joint statement, «Committing to Develop Forest Economies», in which Québec municipalities allocate and integrate forest biomass to heat their public buildings.

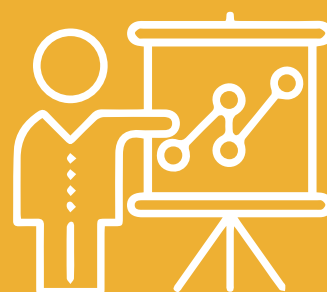
Québec's mobilization, along with robust financial incentives, creates a favourable business environment to establish forest biomass heating systems in the Chaudière-Appalaches region. However, in order to implement new systems in the area, potential investors must be well informed to make decisions pertaining to their communities. It is in this context that Nature Québec and its partners have created «Heating through Forest Biomass: Mobilizing Communities in Chaudière-Appalaches».

THE PROJECT

THE PLAN

The project aims to provide businesses and institutions within the Chaudière-Appalaches region with a new energy option – to provide heating with forest biomass (heating and industrial processes) – allowing them to reduce their energy costs and improve their carbon footprint. To do so, Nature Québec, accompanied by its partners, will coordinate different actions in the region to raise awareness of the forest biomass sector's potential, as well as to inform organizations interested in installing a boiler powered by pellets or wood chips:

- Mobilize regional partners (example: regional and economic development);
- Identify companies and institutions which are likely to install a forest biomass heating plant and reap the most benefit;
- Offer organizations free evaluations to define if their current heat unit (oil, propane, natural gas) can be replaced with a forest biomass heating system;
- Work with six organizations that have the best conversion potential to achieve their goal of installing forest biomass heating system.



The project will create models in the region that will confirm suitable return on investments, savings in energy costs and emission reductions of greenhouse gases made possible through the transition to forest biomass heating systems. This will be in collaboration with the Service Forêt-Énergie team (experts in the field of biomass supply and engineering).

HEATING WITH FOREST BIOMASS

AN OPPORTUNITY TO MASTER ENERGY

Currently, more than one hundred biomass boilers are installed across Québec and the vast majority have been exceptionally successful. New and proven technologies, combined with the use of quality biomass, and trained staff have led to peak technical, economic, and environmental performance.

By mobilizing, informing, and equipping potential customers with tools, we believe it will be possible to launch a dynamic, positive and favourable campaign, spotlighting the biomass sector and further increasing the necessity of production and services offered

across the region (example: supplying equipment, operations, maintenance). Indeed, the biomass heating systems that will be installed, in addition to the ones that already exist, will create a critical need for forest biomass in the area, justifying the development of on-site expertise. Nature Québec will work with Vision Biomasse Québec, a group of 30 members from different backgrounds, including equipment specialists, biomass suppliers, as well as researchers.

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WHY CHOOSE THE REGION OF CHAUDIÈRE-APPALACHES?

Chaudière-Appalaches is one of the regions in Québec that is extremely favourable to the development of residual forest biomass in the heating sector. The potential market for biomass heating systems is estimated to replace 1,206 GWh (about 113 million liters of oil), that equates to 1,763 GWh of biomass fuel potential. In addition, the development of the sector would revitalize the forest industry, considered the third most important trade in the area. Chaudière-Appalaches was also identified as a viable area given its propensity towards organic food industry, which seemed conducive to a region that would be more open to adopt forest biomass as an energy source. The exceptional and flourishing entrepreneurship observed in the region reflects the potential to foster companies interested in cost reduction opportunities in energy consumption. And again, biomass boilers are already prominent in the region (see «Testimonials» section).



PRODUCTS AND SERVICES IN THE REGION

Chaudière-Appalaches is well-equipped with regards to the products and services associated with the forest biomass sector. For supply, the region may rely on a network of producers and distributors in forest biomass, whether in pellets or wood chips, that can cover the entire region. In addition, our main private partner on the project, CGFA Énergie Inc., has been operating in Montmagny for three years as a biomass transformation center, which allows the delivery of wood chips to MRC de L'Islet, Montmagny, Bellechasse, les Etchemins, Lévis and Nouvelle-Beauce.

To provide for the entire region, CGFA Énergie Inc. supported by its cooperative network, along with various forest workers from Beauce surroundings, are working on establishing new transformation

centers that will meet all the anticipated future needs of the area. In addition, three manufacturing plants of wood pellet have been opened in the region of Chaudière-Appalaches, annually producing over 170,000 tons of product. Delivery services in bulk by truck, offered by wood pellets manufacturers and distributors, are available for public and commercial customers.

This proximity to the market ensures shorter delivery distances, which favours fewer transportation costs, as well as lower greenhouse gas emissions. In addition, the use of best practices, such as planning delivery days with distributors, and sizing the pellet reserve, helps secure the supply and keeps prices as low as possible.

Start at, companies like CGFA Énergie Inc. offer biomass heating systems management and maintenance services, and turnkey service energy sales. Several other businesses offer quality heating equipment, many of which are designed and made in Québec. Thus, the production and distribution of forest biomass, as well as companies offering a variety of products and services, allows the biomass heating sector in Chaudière-Appalaches, to be a realistic, affordable, and reliable option.



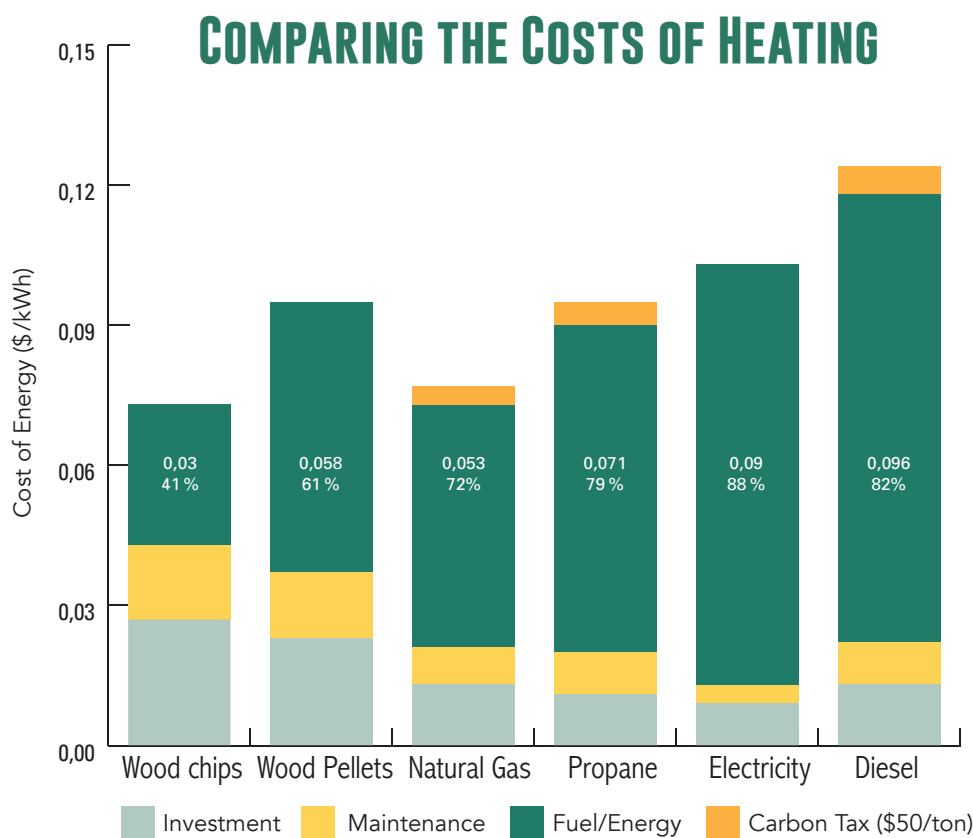
HEATING WITH FOREST BIOMASS

WHAT IS IT?

The main use of forest biomass is to replace traditional fuels (example : diesel, propane, natural gas) to heat buildings or to produce heat within industrial processes. Wood chips (energy chips) are usually derived from forest harvesting residues (example : tree tops). To produce wood pellets, residual wood products (example : sawdust, planks, shavings) are processed. The use of construction, renovation and demolition wood as an alternative fuel in biomass boilers of more than 3 MW is possible, but requires a certificate of authorization from the *Ministère de l'Environnement et de la Lutte contre les changements climatiques*.

WHAT ARE THE BENEFITS?

Replacing fossil fuels with forest biomass generates numerous benefits, ranging from economic, social and, of course, environmental. It significantly reduces production costs of heating for buildings or industrial processes, since the cost of biomass is much lower and more stable, then that of fossil fuels (see graph). Financial aid, in particular offered by *Transition Énergétique Québec*, reduces the cost of acquiring biomass equipment, which can be on the expensive side.



The savings achieved by reducing heating bills for communities can be reinvested in organizations help maintain of local services in some smaller municipalities. The biomass heating sector improves activity for the forest industry, and increases the capacity of the latter to sell forest by-products and diversify its markets. Jobs are also created in the forest industry, adding to related sectors including construction,

management and maintenance of the biomass heating systems. In addition, the use of forest biomass contributes to the fight against climate change by reducing greenhouse gas emissions. Other important benefits are also sector-specific. For example, poultry farming using biomass as a source of heat prevents moisture in the air, increasing animal comfort, and subsequently the performance of chicken farms.

[1] including a carbon cost of \$20.27 / ton for fossil fuels
[2] wood chips (based on price of \$85/green metric tonne (gmt) and 80 % efficiency), wood pellets (based on price of \$230/gmt and 85 % efficiency), natural gas (based on price of \$0.50/m3 and an efficiency of 85 %), propane (based on price of \$0.45/liter and an efficiency of 85 %) and diesel (based on price \$0.87/liter and 80 % efficiency) (Forest Energy Service, 2018).



WHAT IS THE CONVERSION POTENTIAL ?

The conversion potential is essential in order to define if a forest biomass system is able to replace a fossil fuel powered heating system. To determine this potential, we looked at several criteria. Mainly the type and amount of energy currently used to produce heat for buildings and industrial processes, as well as the existence of a distribution system (hot water, hot air, steam).

This information allows the building's mechanical engineer to estimate the total annual energy consumption, the power of the biomass boiler, the type and quantity of biomass (pellets or wood chips) that should be used, and to review whether a biomass heating system could be installed. The mechanical engineer then assigns a «rating» to the evaluated project, based on the interest to install a forest biomass heating system. Using this method, some situations are deemed more suitable to convert to forest biomass systems than others, such as the following cases :

- Projects that allow for the replacement of oil, propane or natural gas and therefore the reduction of GHG emissions (allow access to financial aid) ;
- Projects that are associated with significant energy consumption, which will result in greater annual savings from lower costs of biomass and ;
- Projects for which heat distribution equipment (hot water, hot air, steam) are already in place, enabling the investment costs to be lower.

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WHAT SECTORS ARE MOST LIKELY TO ADOPT THIS SYSTEM?



Forest biomass heating systems have many uses. Heating of individual buildings is the most recognized application. For example, in the public and commercial sector, boilers have been installed successfully in churches, presbyteries, schools, hospitals, municipal buildings, apartment buildings, hotels and garages.



Heating multiple buildings by connecting them to a central boiler room by a system of insulated pipes installed in the ground is also possible. Projects such as these are usually decided at the municipal level. Biomass can also be used to produce heat in the framework of different industrial processes, even those that require high intensity energy. Forest biomass projects have been installed in various industrial sectors, given energy is often crucial to the bottom line (example : requiring a source of power 24 hours a day, 7 days a week).

Uses are incredibly varied and include :

- Large energy consumers : cement, lime, asphalt production plants, mines ;
- Enterprises working in the forestry sector (can use their own wood processing residues) ;
- Companies working in the agricultural sector (example : greenhouses, poultry and pork production, grain drying, maple production) and processing food (example : cheese factories).



CONVERTED MODELS IN QUÉBEC

The examples presented below illustrate the diversity of possible uses of forest biomass for heat production. Other examples can be found on the *Vision Biomasse Québec* website (www.visionbiomassequebec.org).

INDUSTRIAL SECTOR 	Serres Belle de jour : 3,500 kW boiler, installed in 2013
	Mine Casa Berardi : Multiple boilers totalling 4,200 kW, installed in 2014
	Vergers Leahy : 4,500 kW boiler, installed in 2016
	Plancher des Appalaches : 400 kW boiler, installed in 2007
	Fromagerie Boivin : 6000 kW boiler, installed in 2006
COMMERCIAL SECTOR 	La Cité Verte : Boilers totalling 5,000 kW, installed in 2010
	Énergie Milot heat network (3 buildings : Auberge, Restaurant, Dépanneur du parc / Quincallerie Milot. Garage A.J.M. et Garage de la Coopérative forestière de Petit-Paris) : Boiler 250 kW, installed in 2012
PUBLIC SECTOR 	Sayabec Heat Network : 500 kW boiler, installed in 2014
	La Tuque Hospital : 750 kW boiler, installed in 2013
	Sieur-de-Coulonge High School : 440 kW boiler, installed in 2011
	Church of Saint-Germain-de-Grantham : 100 kW boiler, installed in 2015



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FOREST BIOMASS USER TESTIMONIALS

CSSS DE MONTMAGNY AND CLSC DE LAC-ETCHEMIN

What is the project?

Today, the health facilities of Montmagny and Lac-Etchemin (*CISSS de Chaudière-Appalaches*), are heated by forest biomass. The first was originally converted from a heavy fuel oil system to wood chips, and the second from a heavy fuel oil system to wood pellets. In total, the two conversion projects reduced our greenhouse gas emissions by 4929 sq. t CO₂ annually.

What are the advantages of a project like this?

- Modernization of heating equipment at an attractive price (more than 50 % financial assistance was available) (Lac-Etchemin and Montmagny)
- Reduced energy costs (Lac-Etchemin and Montmagny)
- Availability and quality of customer service (Lac-Etchemin)
- Replacement of a polluting energy in an easy way (Lac-Etchemin)

- Reaching the targets required by the *Action Plan on Climate Change 2013-2020*: the elimination of heavy fuel oil for heating purposes. (Lac-Etchemin)
- Contribution to the reduction of greenhouse gases (Montmagny)
- Participation in the economic activity of the region (Montmagny)

What are the keys to success for a project like this?

- Quickly surround yourself with the right partners for the project (example : engineers, contractors, biomass suppliers) (Lac-Etchemin)
- Make sure to work with manufacturers that offer proven technology (Montmagny)
- Opt for a quality biomass supplier (Montmagny)
- Plan in advance to have the boiler operated by qualified staff (Montmagny)



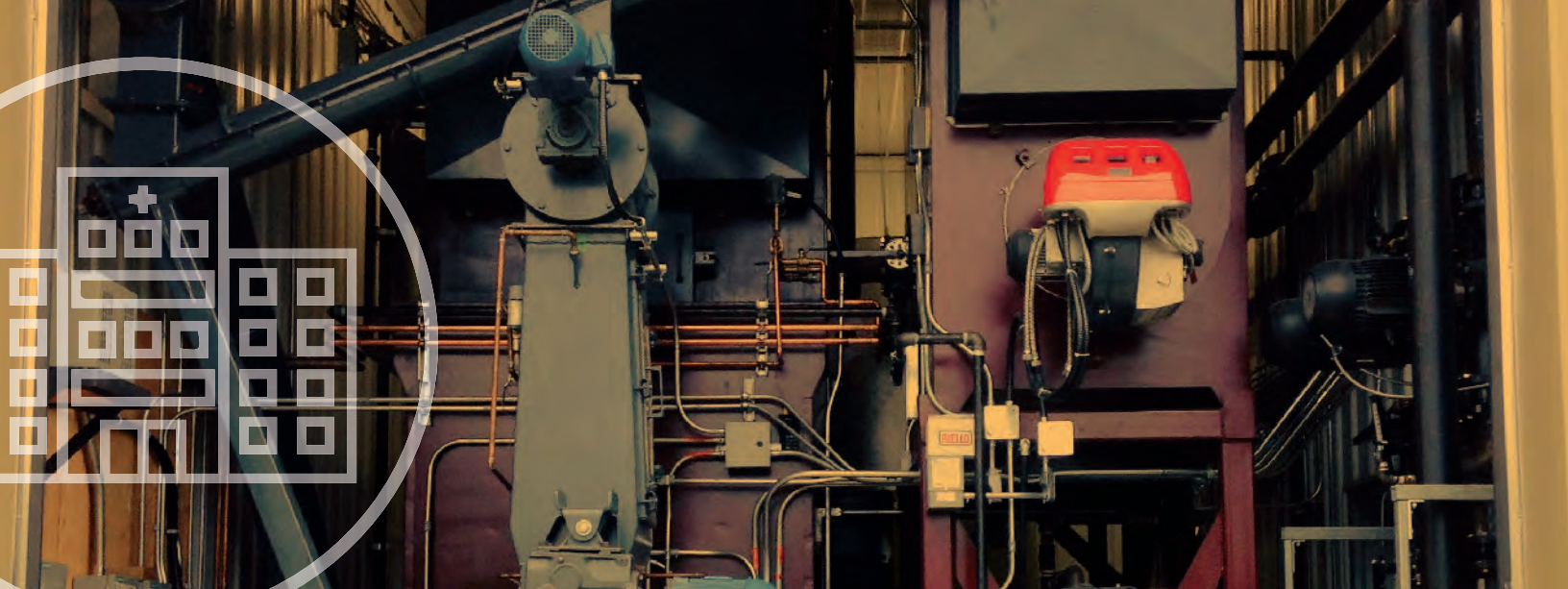
Conclusion

Based on their experience and taking into account the energy options available in the area, both institutions said they would still opt for a forest biomass facility if they had a choice. They emphasized the importance of integrating the success factors mentioned above into the planning stages, particularly to facilitate the early days of setting up a biomass heating system.

PROJECT CHARACTERISTICS

CSSS de Montmagny			
Year of Installation :	2015	Power of the Boiler :	2900 kW
Fuel Replaced :	Oil	Biomass type used :	Wood chips (2,673 dry metric tonnes (dmt) in 2017)
Cost of Project :	\$ 2,800,000	Financial aid :	\$ 1,616,000
Reduction of GHG emissions :	3,129 sq. t CO ₂	Annual savings :	\$ 183,323

CLSC de Lac-Etchemin			
Year of Installation :	2014-2015	Power of the Boiler :	1,700 kW
Fuel Replaced :	Heavy fuel oil	Biomass type used :	Wood Pellets
Cost of Project :	\$ 1,700,000	Financial aid :	\$ 1,400,000
Reduction of GHG emissions :	1,800 sq. t CO ₂	Annual savings :	\$ 150,000



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RIVIÈRE-BLEUE MUNICIPAL HEAT NETWORK

The municipality of Rivière-Bleue decided in 2015 to carry out a heat network restructuring project that allowed the system to heat eight buildings (the church, community hall, presbytery, school, camp, library, town hall and arena) with forest biomass. Replacing light fuel oil and electricity with biomass has reduced their greenhouse gas emissions by 125 tonnes annually, as well as energy costs by 25 %.

What are the advantages of a project like this?

- Reduced heating costs for the municipality, as well as for other organizations connected to the network.
- Creating economic benefits for local biomass suppliers.
- Developed a team of experts in the municipality, which operate the network, that are more invested in upkeep given they own the system.
- Increased comfort in buildings.
- Availability of customer service (consultant, equipment supplier and biomass supplier).
- Security of regional forest biomass supply.
- Ensuring that energy needs are met at all times (presence of a backup system in case of breakdowns, which are infrequent).



What is the key to success for a project like this?

Ensure the involvement and training of employees who are in charge of the day to day operation of the heating equipment (in this case, the employees of the municipality).



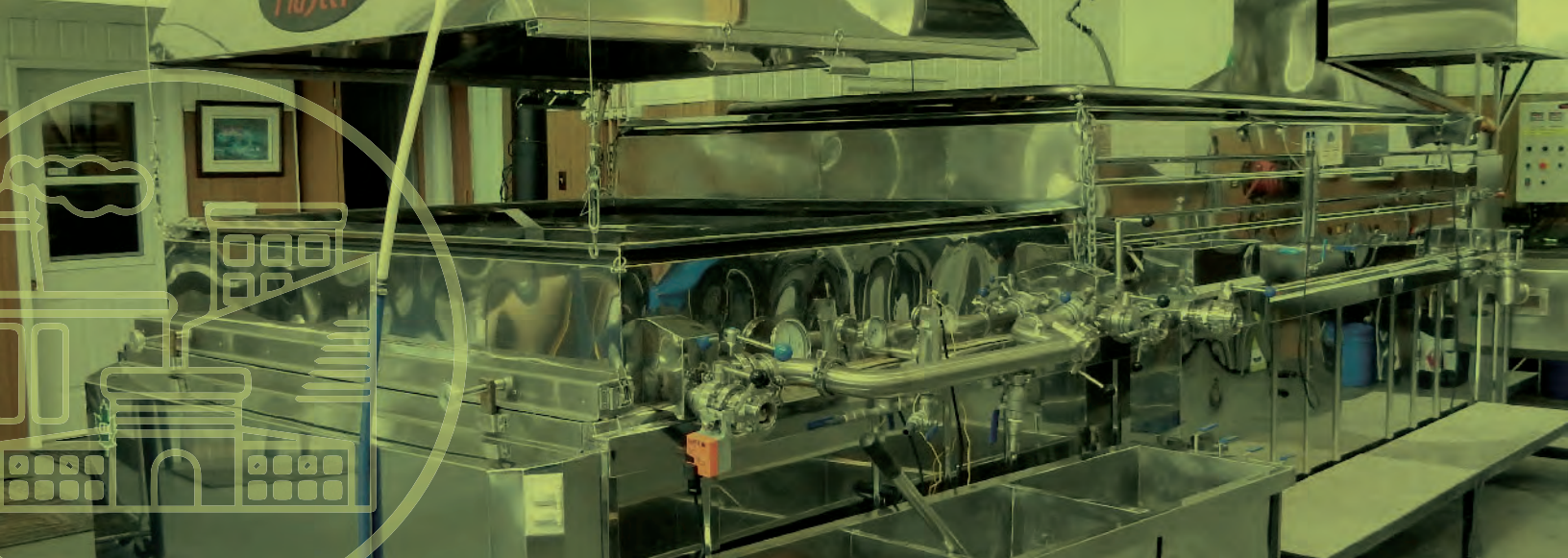
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Conclusion

In the end, though some modifications were made to the equipment since it was installed in 2015, the municipality has seen a vast improvement to their heating system and would make the same choice today without hesitation to invest in a forest biomass boiler.

PROJECT FEATURES

Municipality of Rivière-Bleue Heat Network			
Year of Installation :	2015	Power of the Boiler :	500 kW
Fuel Replaced :	Oil and electricity	Biomass Type Used :	Wood chips (300 dmt)
Cost of Project :	\$ 800,000	Financial Aid :	\$ 200,000
Reductions in GHG Emissions :	125 sq. t CO ₂	Annual savings :	25 %



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SAINTE-KATERI-TEKAKWITHA PARISH AND LA COULÉE CREUSE SUGAR BUSH

The original heating system in the church of Sainte-Germaine de Lac-Etchemin was obsolete and was not adapted to their current energy demand. The decreased heating costs was one of the incentives which led Sainte-Kateri-Tekakwitha Parish to turn to forest biomass.

For La Coulée Creuse Sugar Bush, located in Saint-Athanas, they chose to convert from oil to a system that operated on wood pellets. The choice was motivated mainly for environmental reasons, but also reduction in the cost of production, driven by an annual \$ 40,000 in heat expenses.

Sainte-Kateri-Tekakwitha Parish			
Year of Installation :	2014	Power of the Boiler :	56 kW
Fuel replaced :	Oil	Type of Biomass Used :	Wood Pellets
Cost of Project :	\$ 206,000	Financial Aid :	\$ 103,000
Reduction in GHG Emissions :	60 sq. t CO ₂	Annual Savings :	\$ 8,300

La Coulée Creuse Sugar Bush

Year of Installation :	2018	Power of the Boiler :	N / A
Fuel replaced :	Oil	Biomass type used :	Wood Pellets
Cost of Project :	\$ 150,000	Aide financière :	\$ 118,000
Réduction des émissions de GES :	94 sq. t CO ₂	Économies annuelles :	\$ 40,000

Conclusion

Although their respective projects are very different from each other, the two places interviewed identify the same benefits :

- Modernization of the heat production system at an attractive price (availability of financial aid).
- Efficiency and reliability of the newly installed system.
- Substantial reduction in heating costs.
- Reduction of greenhouse gases.
- Reduced system maintenance time, and high expectations for return on investment.

Both organizations are very satisfied with their facilities.

«If we were to make the decision again today, we would opt without any hesitation for the installation of a forest biomass boiler.»

- La Coulée Creuse Sugar Bush



«We are very satisfied with the system that was installed, and it is extremely efficient and economical.»

- Sainte-Kateri-Tekakwitha



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CONTACT US

As part of this project, we wish to collaborate with as many regional stakeholders as possible willing to contribute to the development of the sector and / or looking to install a heating system using forest biomass.

Please do not hesitate to contact us if you wish to get involved in the process or for additional information!

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