Natural Resources Canada | Ressources naturelles Canada

2023 Canadian Bioheat Database: Community, Commercial and Institutional Bioheat Installations in Canada

2023

Canada

CanmetENERGY CANADA
OPEN FILE XXXX

2023 Canadian Bioheat Database: Community, Commercial and Institutional Bioheat Installations in Canada

2023

Cat. N° M154-177/2024E-PDF
ISBN 978-0-660-71448-6

Recommended citation
20203 Canadian Bioheat Database: Community, Commercial and Institutional Bioheat Installations in Canada; CanmetENERGY, https:// https://natural-resources.canada.ca/our-natural-resources/energy-sources-distribution/renewable-energy/bioenergy-systems/7311.

INTRODUCTION

In 2023, CanmetENERGY has issued a contract to Torchlight Bioresources to update the Canadian Bioheat Database for community, commercial and institutional installations. This publication is revised and edited from its original by NRCan, though the modifications are minor.

This publication summarizes the findings of the 2023 survey of the bioheat equipment suppliers, distributors and users in Canada. The report gives details on the methodology and approaches used in updating the survey information and provides detailed analysis on the bioheat facilities according to their locations, scale and types of biomass fuels. It also provides recent trends in the segments of the market that have installed bioheat systems and on the major project developers and suppliers of the systems.

The results of 2023 Canadian bioheat survey is used to transform the data into a visualization dashboard using charts and graphs. The dashboard provides at-a-glance visibility on the trends for bioheat installations across Canada, such as the number of facilities, installed capacity in MWth, fuel types etc. The reader is encouraged to visit https://torchlightbioresources.com/canadian-bioheat-database to access the visualization dashboard tool.

This work was supported by Natural Resources Canada's Program of Energy Research and Demonstration (PERD) funding program.

Updating of the Canadian Bioheat Database

Community, Commercial, and Institutional Bioheat Installations in Canada

FINAL REPORT
September 2023

Authors:

Torchlight Bioresources

Fryderyk Janowski,
Jean Blair, PhD
Jamie Stephen, PhD

Revised by Sebnem Madrali, NRCan (January 2024)

EXECUTIVE SUMMARY

In 2014, CanmetENERGY, Natural Resources Canada initiated development of a database of existing Canadian solid biomass heating installations ranging in size from 150 kW to 5 MW. This Canadian Bioheat Database ("*Bioheat Database*") was updated several times in the past with expanded scope to include projects in the size range from 50 kW to 149 kW, namely in 2016, 2017, 2020 and 2021. This report is a compilation of the results from the most recent survey carried out in 2023 for the Canadian *Bioheat Database*. Multiple updates have permitted tracking of bioheat industry growth and trends over time.

Creation of the *Bioheat Database* relied heavily on a review of industry and government reports, Internet searches, and interviews. Interviews and conversations were carried out with a broad variety of bioheat industry representatives, including equipment distributors, project developers, and government personnel, which provided insightful information to be included in the *Bioheat Database* and accompanying reports.

As of August 2023, the Canadian *Bioheat Database* includes 646 bioheat projects of which 184 are new additions since the 2021 update. This corresponds to 481 MWth installed capacity, an increase of 61 MWth compared to 2021. The following trends are observed in 2023 update in comparison to the previous updates:

- Canadian bioheat market has been growing steadily since 2008. In 2023, industry growth continues to be strongest in QC with 50 new installations. Several other provinces also had strong growth with more than 10 new bioheat systems in NT, BC, ON, NE, PE, and NS since 2021. At least one new system was installed in all other provinces and territories except Nunavut;
- All new bioheat systems added to 2023 *Bioheat Database* are heat-only (not CHP);
- 83% of all projects are 1 MW_{th} or less, with most larger scale systems heating agricultural buildings, greenhouses, small industrial facilities, or large public facilities such as hospitals and universities;
- Bioheat growth in the private sector (commercial, agricultural, multi-unit residential, and light industrial combined) is now stronger than in the public sector, though institutions continue to provide an important market, particularly outside of QC and NB;
- Agricultural sector has become an important market for small-scale bioheat, with almost a third of bioheat systems installed since 2021 are in this sector;

- European-manufactured boilers are increasingly prevalent in the Canadian bioheat market. These are typically hot water boilers with automated ignition, fuel feed system and ash removal, and have integrated controls (such as recirculation of flue gas, lambda (oxygen) sensors, temperature sensors).
- Wood pellets and wood chips still dominate as the two main types of biomass fuels, with preference regionally specific; and
- 46% of commercial and institutional bioheat systems <5 MW are in a rural or remote community.

TABLE OF CONTENTS

LIST OF TABLES OF FIGURES

GLOSSARY

QC: Quebec
YK: Yukon
NW: Northwest Territories
BC: British Columbia
ON: Ontario
MB: Manitoba
SK: Saskatchewan
NS: Nova Scotia
NB: New Brunswick
NL: Newfoundland and Labrador
PEI: Prince Edward Island
AB: Alberta
NT: Nunavut

1 BACKGROUND AND UPDATING APPROACH

The Canadian *Bioheat Database* was created in 2014 to capture information on bioheat projects in Canada within the scale range of 150 kW to 5 MW thermal (th). The database was created and populated in 2014 as part of CanmetENERGY – Natural Resource Canada's project on the Development/Adaption of Standards for Solid Biomass Fuel and Heating Equipment in Canada. The database was updated multiple times in 2016, 2017, 2018, 2020, and 2021. In 2017, the scope was expanded to include projects from 50 kW_{th} to 149 kW_{th}.

Key information in the Canadian *Bioheat Database* and trends observed over the past years have been presented at various conferences and workshops, published in industry / trade magazines and shared with industry personnel. Over the years, sector participants, including equipment distributors, project developers, NGOs, and government regulators, have become familiar with the processes and are generally happy and willing to provide information on installations and their experiences in the bioheat industry. While creation of the database relied heavily on industry and government reports and internet searches, the database updates have largely involved requests for documentation and phone calls to sector participants. In general, there is less information about recent projects in online news articles and on company websites than there was for earlier projects. Perhaps this signifies that biomass heating is becoming more mainstream; not every new project warrants a press release.

Typically, contributors to the survey were emailed with an Excel file containing extracted dataset from the *Bioheat Database* specific to their organizations or regions, and asked to review the information and add any systems that are missing. This has proven to be an efficient and effective way to validate existing *Bioheat Database* entries and obtain new information.

An online search and review of relevant news sources, funding program recipients, and provincial reports and databases was also performed to scan for new boiler brands or project developers or projects installed by companies not in the contact list. An article published in Canadian Biomass Magazine in 2023 led to one new source of data for the Database. Data gaps continue to exist – particularly for older projects – but the continued high concentration of the industry (i.e., limited number of manufacturers and distributors of boiler equipment) and continued engagement with these companies has resulted in a comprehensive profile of most new projects.

As part of this year's update, TorchLight created a visual summary ('Dashboard') of the data using Tableau, intended for public consumption, to be hosted on a website once the future host of the database has been confirmed. The web-based approach will allow the public to visualize and explore the data contained in the Canadian *Bioheat Database*, adding value for contributors as well as facilitating the quantification the role of bioheat in the renewable heating sector can play.

This is the last year that CanmetENERGY plans to update the Canadian *Bioheat Database* under the current program and hopes to transfer the responsibility of updating and maintenance of the *Bioheat Database* to key industrial or government stakeholders. An online form was created to test a more automated method for data entry but contributors found this too time consuming and preferred to update the Excel sheet.

2 BIOHEAT SECTOR SUMMARY

2.1 PROVINCE

As of August 2023, the Canadian Bioheat Database includes a total 646 operational commercial and institutional bioheat systems, 86 of which heat more than one building in a small district heat network. Since the last database update in August 2021, 184 new systems have been added. Most of the new additions to the Bioheat Database are systems that were installed in the past two years, while 20 were installed prior to the 2021 update but had not previously been identified. Two new bioheat system installers / developers (Heizomat, Nature Québec) were identified through the 2023 update, both of which primarily target the agricultural sector, and together account for all new *Bioheat Database* additions installed prior to 2021 (i.e., missed in the previous update). New bioheat systems were identified in all provinces and territories, except Nunavut, where there are still no modern bioheat systems due to the remoteness and challenges related to logistics and supply chain infrastructure. Seven entries were removed from the database that are no longer operating or were not realized.

Québec is the province with by far the greatest number of projects installed – 221 – which is more than 30% of the national total. Forty-three projects in Québec were added since the 2021 update, most of which (32 of 43) received provincial government funding through the Transition Énergétique Québec Bioenergies program. After a pause in the early 2020's, bioheat sector growth resumed in the Northwest Territories, with 15 new projects since the 2021 update. This brings the total number of bioheat installations in the Territory to 96, the second highest of all provinces and territories. BC remains third with 82 installations, including 10 added to the database since 2021.

Development in New Brunswick has also remained strong, with 10 new bioheat systems in the database, all in the private sector, bringing the total to 70. Fewer new systems have been added in other Atlantic provinces since the 2021 update, with four systems in Nova Scotia, and only one each in Prince Edward Island and Newfoundland.

Ontario saw 17 new additions to the Bioheat Database in 2023, bringing the total to 59 in the province. Sixteen of the newly added systems in Ontario are almost exclusively in the agricultural sector and were all installed between 2018 and 2022 and were developed by Heizomat Canada, a boiler supplier that was not included prior to the 2023 update.

Five bioheat systems are now in operation in Saskatchewan, where only two projects were under development at the time of the 2021 update. Additionally, two new projects were added to the Database in 2023 in Alberta, which now has 13 systems; two projects were added in Manitoba for a total of 16; and two systems were recently installed in the Yukon, where there are now 12 bioheat systems in operation.

The map in Figure 1 shows the total number of systems in the 2023 Bioheat Database in each province and territory.

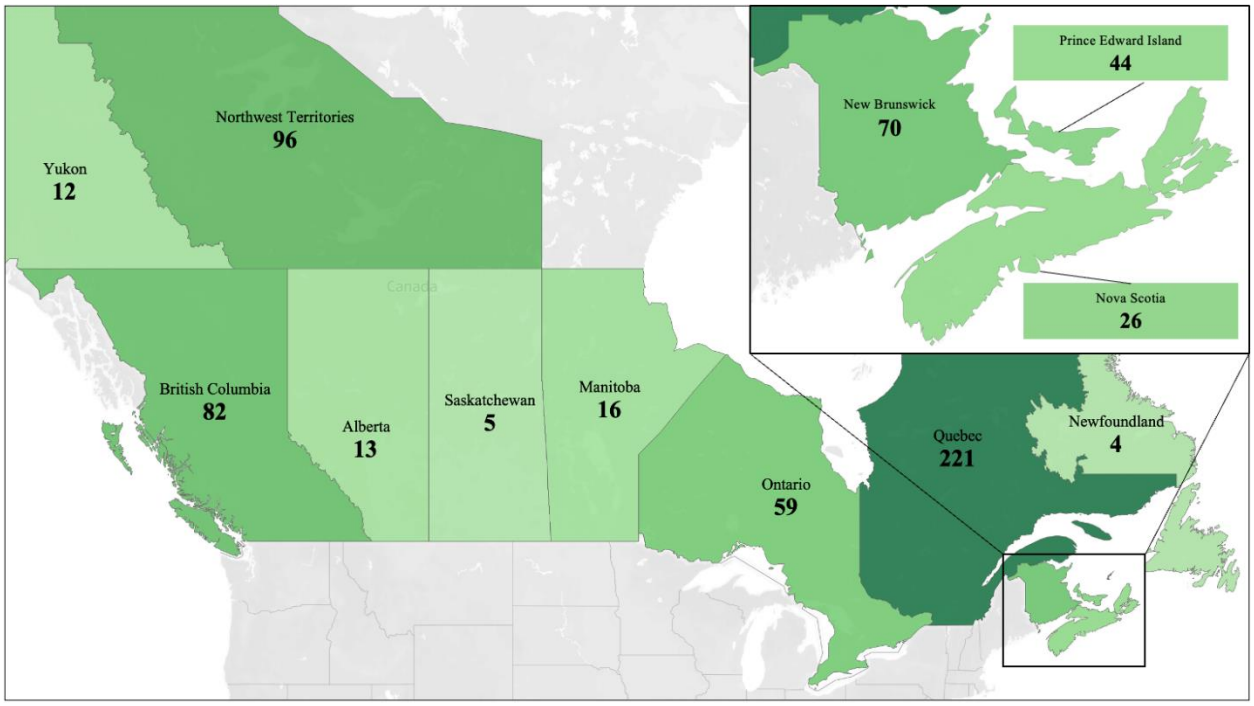

Figure 1: Number of Bioheat Systems by Province/Territory

2.2 GROWTH TREND

Growth in the commercial and institutional bioheat sector has been steady, with an average of 44 systems installed annually since 2012. The annual number of installations has fluctuated due to market conditions and provincial, territorial, and federal policies and funding programs. Following a lull in activity in 2020, likely linked to disruptions caused by the Covid-19 Pandemic, growth accelerated in 2021. A total of 73 new biomass heating systems with a combined capacity of 50 MW_{th} were commissioned in Canada in 2021, the most ever installed in a single year. As of August 2023, there is a total of 481 MW_{th} of biomass heating capacity in the commercial and institutional sector in Canada, nearly double the total capacity installed in 2014 when the database was first established. Figure 2 shows the number of bioheat projects installed annually as well as the cumulative number of projects installed since 2000. Figure 3 shows the total and cumulative thermal capacity of the installed systems. Comparing the two figures, the average capacity of the systems installed has decreased over the last 20 years, a trend that is also confirmed in the installed size range of bioheat facilities as shown in Figure 4 in the next section.

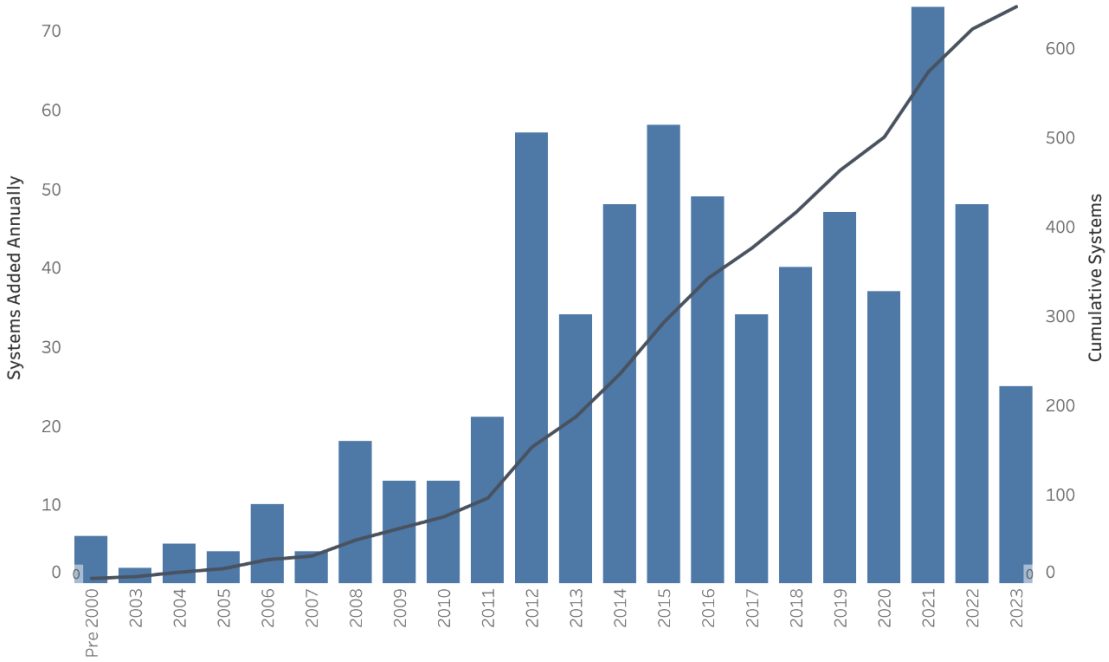

Figure 2: Number of Commercial and Institutional Bioheat Systems

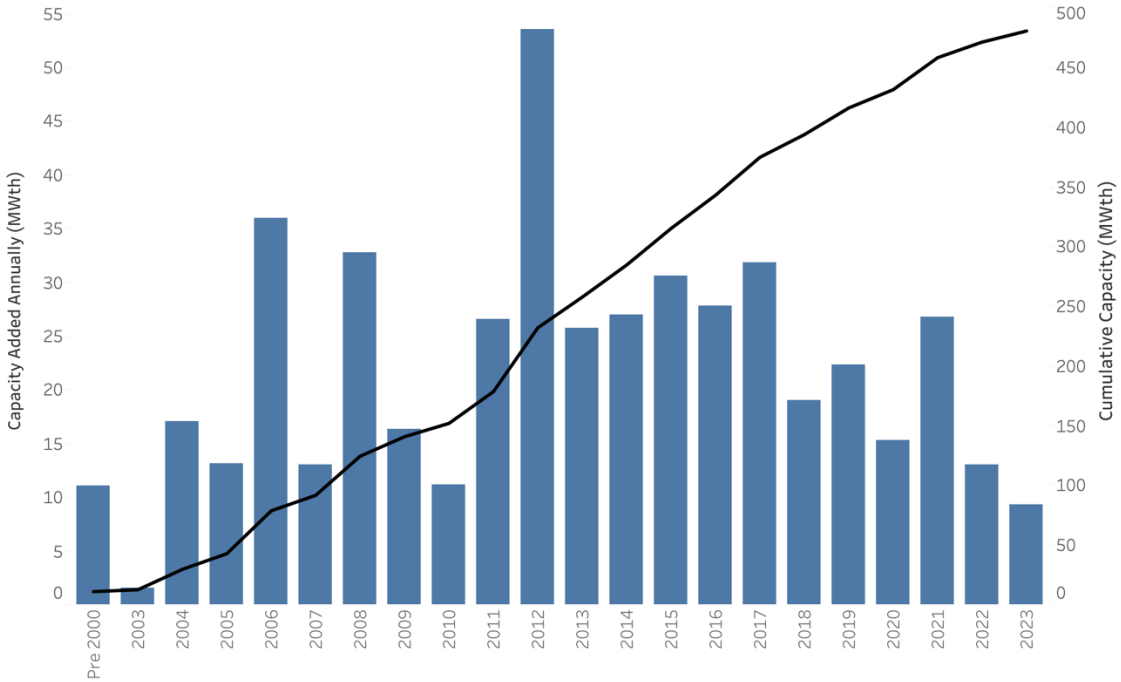

Figure 3: Capacity of Commercial and Institutional Bioheat Systems

2.3 SCALE

When grouped by scale category, in general, there are more small scale projects than large scale (i.e. greater than 1,000 kWth) , as shown in Figure 4. More than 80% of the projects in the database are less than 1 MW_{th} in capacity. Of the 146 bioheat systems installed since January 2021, only four are larger than 1 MW_{th} and 80% are smaller than 500 kW_{th}. Market demand, diversity of boiler options at a small scale, established biomass supply chains, and streamlined permitting are likely the main reasons for the smaller projects becoming more common. The lower capital cost and streamlined installation of the smaller 'off-the-shelf' biomass boilers, available now from a handful of suppliers, compared to the more customized boiler at larger size, also likely contributes to this trend of increasing number of installations in the smaller size range of biomass heating systems.

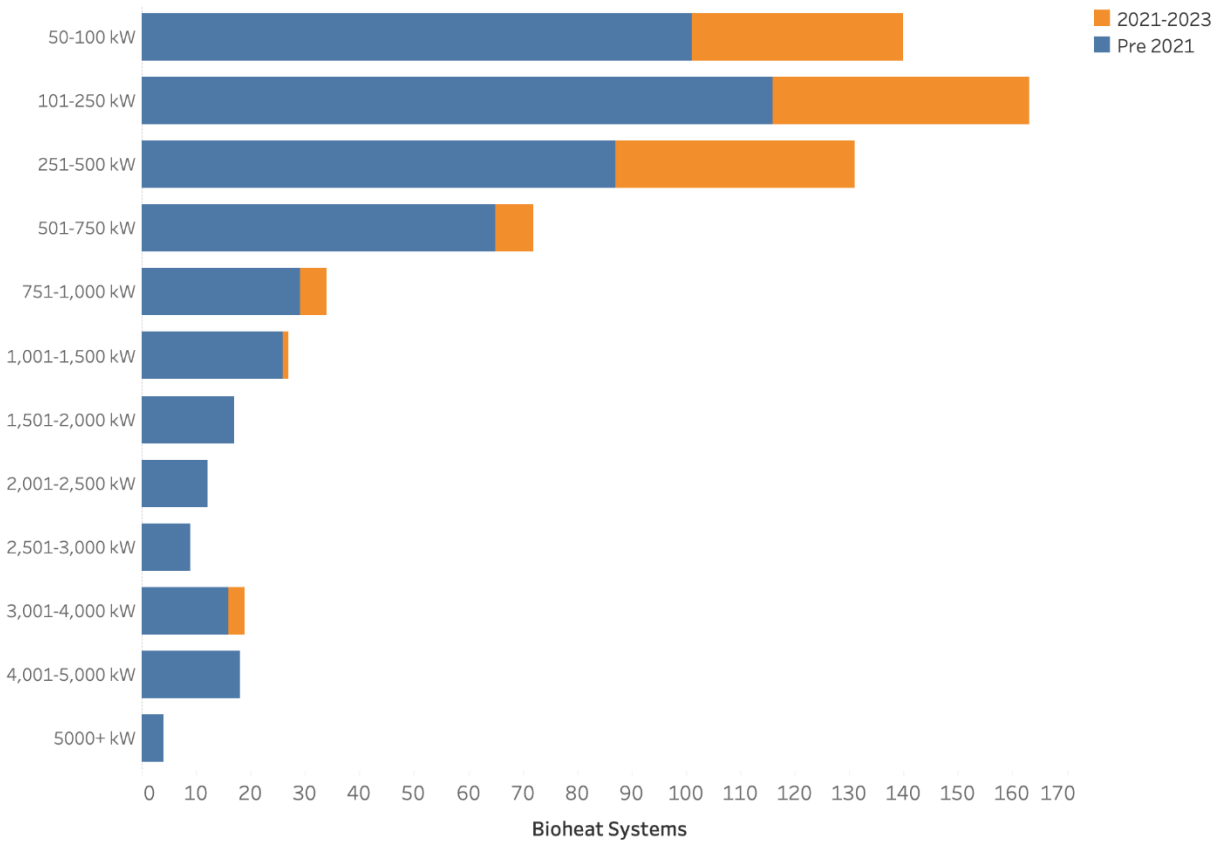

Figure 4: Number of Bioheat Systems by Capacity Category

2.4 SECTOR

The distribution of Canadian bioheat systems by sector is presented in Figure 5. Sector definitions used for the 2023 report are provided in the breakout box below. Note this differs from past reports. Public and private institutions (e.g., schools, hospitals, recreation centers, churches) are the strongest market for bioheat project developers in Canada, with a total of 297 installations in the institutional sector across the country in 2023. Much of the growth in the institutional sector has been due to government procurement policies – whether with the purchase of biomass boilers outright or offering long-term heat purchase agreements to biomass boiler owners and/or operators. There have also been several community-based biomass projects, heating municipal or First Nation-owned buildings, developed in remote, rural, and indigenous communities recently. Many of these projects are supported by capital funding from the Clean Energy for Rural and Remote Communities (CERRC) bioheat program and/or other government funding programs.

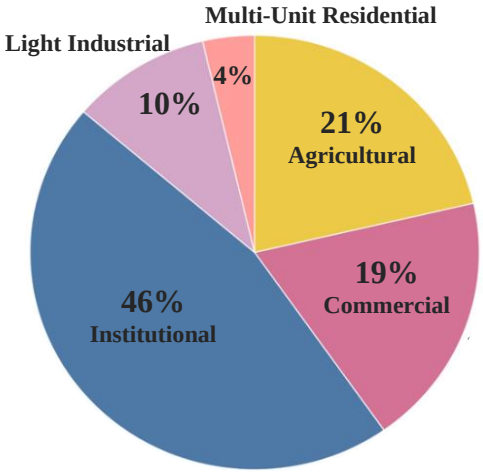

Figure 5: Distribution of Bioheat Systems by Sector

Sector Definitions 2023

Note that sector definitions have been altered from previous reports

Institutional: Any structure that is owned by public or private sector that fulfills a role related to healthcare, education, recreation, or public works. Some examples include schools, hospitals, libraries, religious buildings, sport & recreational buildings, nursing homes, medical centers, civic centers.

Commercial: Buildings that are typically owned by the private sector, such as retail stores, shopping centers, shops, hotels/motels hotels, pubs, restaurants, cafes, health and athletic clubs, commercial warehouses, service stations, or garages

Agricultural: Greenhouses, barns, and other on-farm structures

Multi-Unit Residential: Apartments, condos, or other residential buildings with multiple dwellings

Light Manufacturing: Buildings and constructions that are part of manufacturing industry. This includes warehouses, facilities in lumber and wood products, furniture manufacturing, food processing etc.

Québec and New Brunswick, and to a lesser extent British Columbia and the Northwest Territories, have the strongest demand for bioheat in the private sector, which includes commercial buildings, small industrial facilities, and agricultural buildings. This trend was recognized in the 2018 update and has continued over the last five years. Established regional biomass supply chains and the presence of a reliable feedstock supplier appear to play a role in the growth of biomass heat in the commercial sector.

The smallest bioheat systems (<150 kWth) are most likely to be in commercial buildings while systems between 150 kWth and 1 MWth are primarily found in institutional installations and large-scale projects are predominantly in the small industrial or agricultural sector, with some heating hospitals and university campuses as well (Figure 6). The locations of larger projects tend to coincide with regions that have strong forestry (BC, Québec) or agriculture (southwest BC, Manitoba, southern Ontario) sectors.

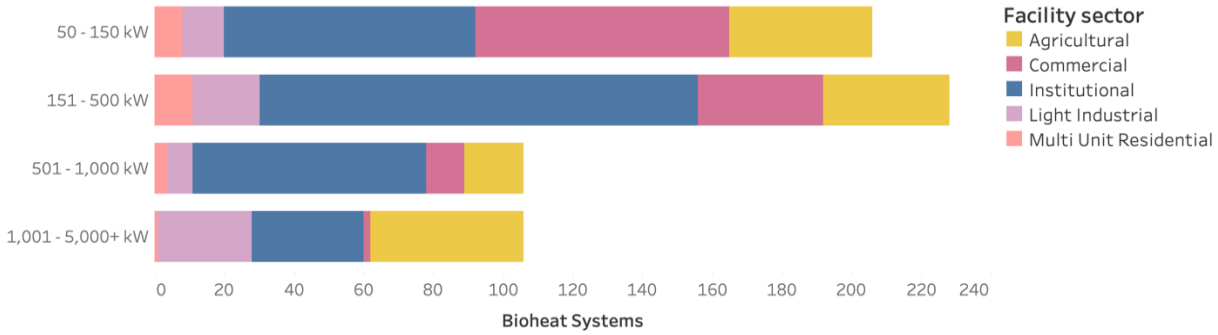

Figure 6: Number of Bioheat Systems by Sector and Capacity

2.4.1 RECENT TRENDS

A total of 146 bioheat systems have been developed since January 2021. Figure 7 below shows the recently developed biomass heating systems by sector and province. Many of the previously identified trends have continued over the last two years. For example, there have been more installations in the institutional sector (53 of 146) than any other single sector. However, growth of bioheat in the private sector (all non-public sectors combined) now far outweighs growth in the public sector.

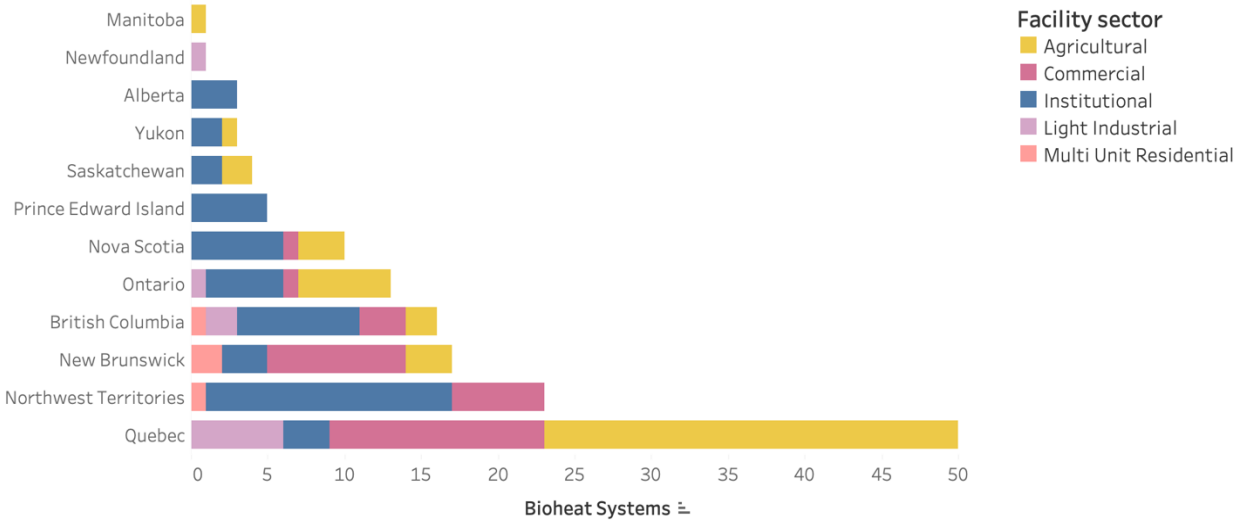

Figure 7: Bioheat Systems by Sector and Province Installed 2021-2023

Much of the growth in the private sector has been in the agricultural sector (45 of 146), particularly Québec, Ontario, and Nova Scotia. In fact, more than half of new agricultural systems are located in Québec. Many of the earlier biomass heating systems in the agricultural sector were installed to heat greenhouses and were several megawatts in scale, while most of the more recent agricultural bioheat systems are smaller in size (in the range 100 – 500 kW_{th}) and installed to heat poultry barns and other barns and outbuildings.

Demand in the commercial building sector continues to be strongest in Québec and New Brunswick, followed by Northwest Territories and BC.

2.5 BIOMASS FUEL TYPES

It is estimated that that commercial and institutional bioheat systems in Canada have a total biomass demand of more than 250,000 bone dry tonnes annually. In this small but regionally important biomass market, high-quality fuels dominate feedstock selection, with more than 90% of all projects using either wood pellets (46%) or clean wood chips/energy chips (45%), as shown in Figure 8. A breakdown and description of fuel types and sources is provided in the below box.

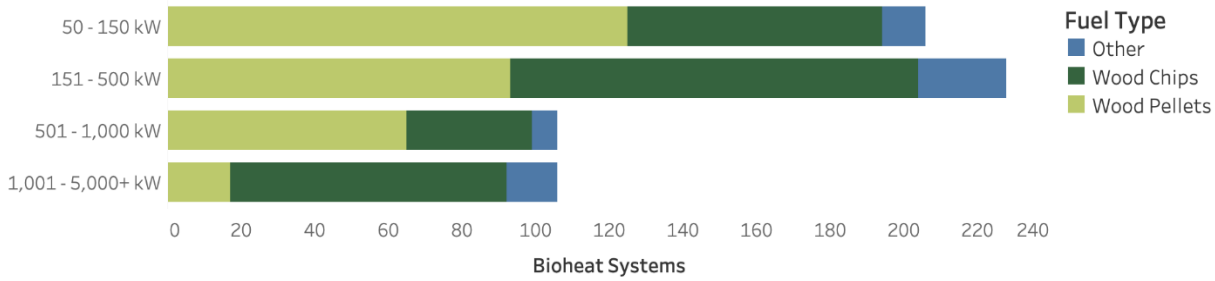

Figure 8: Bioheat Systems by Fuel Type and Capacity

The choice between wood chips and pellets is impacted by scale, sector, and regional biomass supply chains. Projects larger than 1 MW_{th} most often use wood chips or hogfuel, while smaller projects, especially those less than 100 kW_{th}, primarily use wood pellets (Figure 8). Wood pellets are used more often than wood chips to heat commercial and multi-unit residential buildings, while wood chips are used more often to fuel agricultural and small industrial bioheat systems (Figure 9). In the institutional sector, the choice between wood chips or pellets seems to be driven by scale and geography and there is an even split between the two fuel types.

All projects in Prince Edward Island use wood chips from sawmill or chipped from forest residuals or salvage wood. This is due to the Government of PEI's prioritization of in-province fuel supply. Wood chips also dominate in Québec and BC, while nearly all in New Brunswick, Ontario, and the

Northwest Territories rely upon pellets. Systems that utilize urban wood waste are generally located close to urban centers.

Fuel Type Definitions 2023

Note that fuel type definitions have been altered from previous reports

Wood Chips: Chipped wood with a defined size, a typical length of 5 to 50 mm, and a low thickness compared to length; produced by mechanical processing with sharp tools.
Wood Pellets: Densified biomass fuel in a cylindrical form with a diameter up to 25 mm, length 5 to 40 mm
Briquettes: Densified (compressed) biomass fuel in a cubic or cylindrical form with a diameter > 25 mm.
Firewood: Cut and/or split logs, that are dried and has uniform length, typically in the range of 15 to 100 cm
Hog Fuel: Mix of bark and wood fiber in varying size and shape that are produced by rollers, hammers or flails. Hog fuel may include sawdust or shavings, that are thin slices or slivers of wood
Herbaceous Biomass Fuels: Includes pellets, briquettes or bales produced mainly from residues of agricultural crop production, such as wheat straw, flax shives, corn stover or oat hulls, or food processing residues

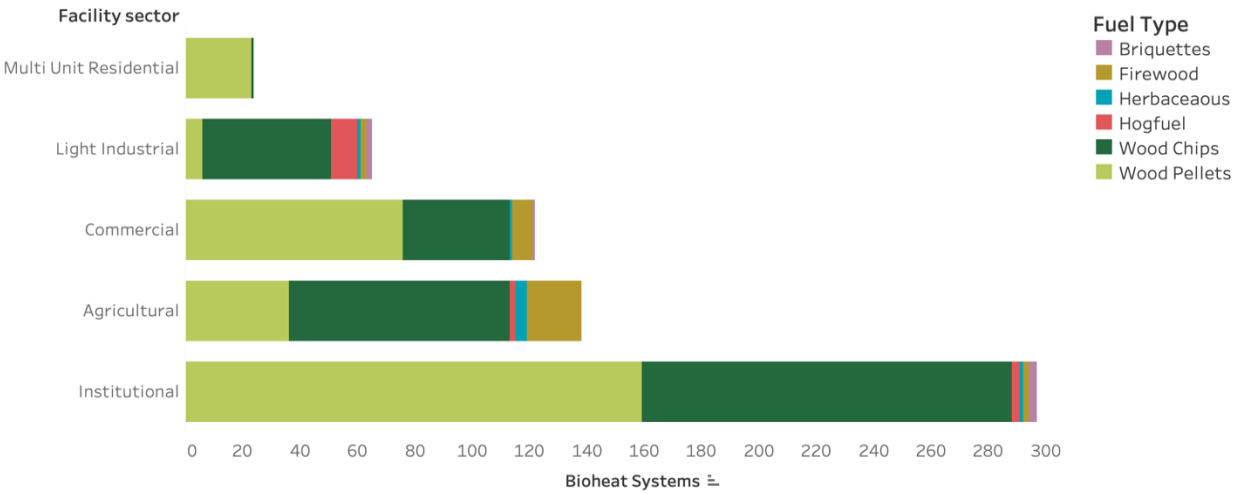

Figure 9: Number of Bioheat Systems by Fuel Type and Sector

Several remote, rural, and Indigenous communities have established local wood chip supply chains to fuel community bioheat systems, creating local economic development and employment opportunities. Due to the remote location and the lack of an industrial forest sector, projects in the Northwest Territories utilize wood pellets imported from Alberta and BC almost exclusively and

several regional bulk pellet delivery companies have now been established. Bulk pellet delivery hubs have also been established in Wikwemikong, Ontario; Hazleton, BC; and across New Brunswick. Having access to local bulk delivery appears to drive growth of smaller-scale projects that may not otherwise be feasible, and of bioheat in the commercial sector.

Other biomass fuels include hogfuel, used in some small industrial facilities and a small number of agricultural and institutional facilities, and agricultural residues, used in a few agricultural bioheat systems and a handful of buildings in other sectors.

A growing number of bioheat systems use firewood or split logs as fuel. All but three of these modern firewood boilers are in Québec and most of these are manufactured by Sequoia. Another supplier is Fröling which is used in three projects in other provinces.

2.5.1 RECENT TRENDS

Wood pellets and wood chips continue to be the most common fuels used in commercial and institutional bioheat systems, though wood chips (47%) are used somewhat more frequently than pellets (39%) in systems installed since January 2021. There were no systems installed in the last two years that use hogfuel or agricultural residues and only one that is fuelled by briquettes. Nearly a third of the recent bioheat systems in Québec, as well as two in the Yukon, use firewood but this is not seen in other provinces or territories. The geographic trends described earlier also still hold true, with pellets dominating in New Brunswick and Northwest Territories and wood chips being more common in other provinces (Figure 10).

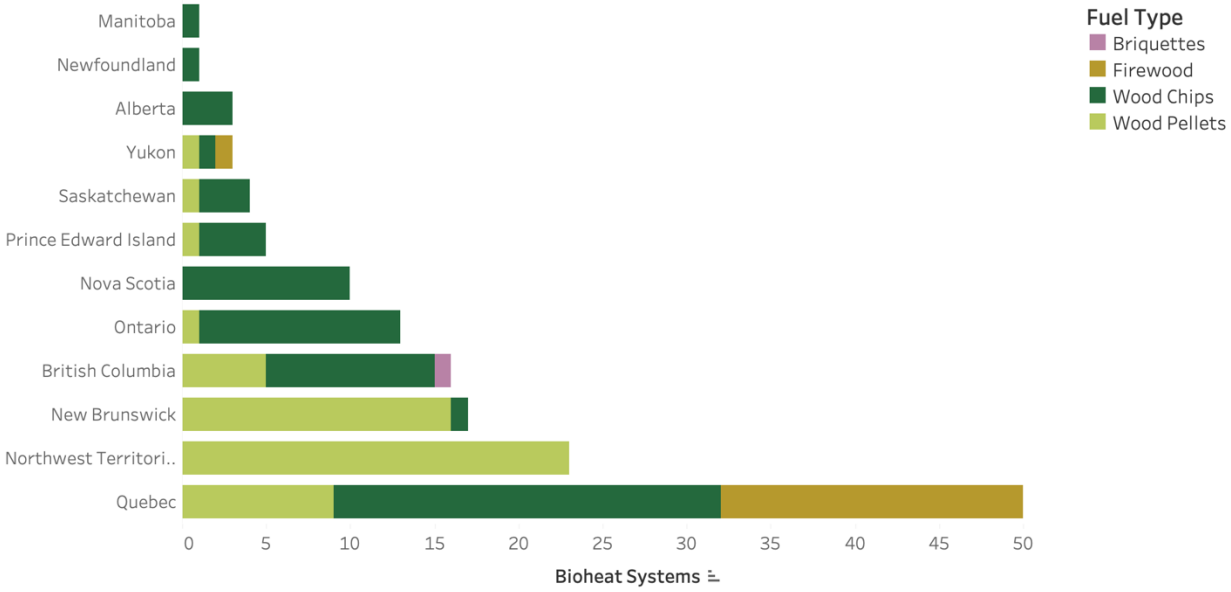

Figure 10: Bioheat Systems by Fuel Type and Province Installed 2021-2023

2.6 DEVELOPERS AND MANUFACTURERS

The Canadian bioheat market is still immature compared to European markets and the number of developers and installers is limited. A handful of companies are capturing most of the bioheat industry growth, as their facilities have shown success, resulting in customer confidence and more projects. Challenges also remain in obtaining certification for small-scale biomass boilers in many Canadian jurisdictions. Most project developers/boiler distributers are focused on sales in a given region and provide support throughout the planning, installation, and start-up process as well as technical support to ensure smooth operation after start-up. Some project developers partner with engineering firms, HVAC companies and/or plumbers to streamline project design and installation, while others have in-house installation teams, often with specialized expertise on a single boiler brand.

Since the inception of the Canadian *Bioheat Database* in 2014, German boiler manufacturer Viessmann, which acquired Austria-based Köb, has the largest share of Canadian non-residential bioheat market. This has not changed in 2023 and there are 145 installations across Canada using bioheat systems from Viessmann, ranging from 60 kW_{th} to 5 MW_{th}. The high-volume Austrian manufacturers – HERZ, Fröling, Hargassner, and ÖkoFEN – are also well represented and have continued to increase their market share over the last several years (Figure 11). Germany-manufactured Heizomat, which only had one installation prior to 2018, has also been increasing its market share rapidly in the last few years. Heizomat boilers are exclusively installed in the private sector – and primarily in agricultural or small industrial facilities – mainly in Ontario and Quebec to date. Québec manufactured Séquoia boilers, which use firewood as fuel, have also been increasing in popularity. Séquoia boilers are exclusively found in Québec in private sector facilities.

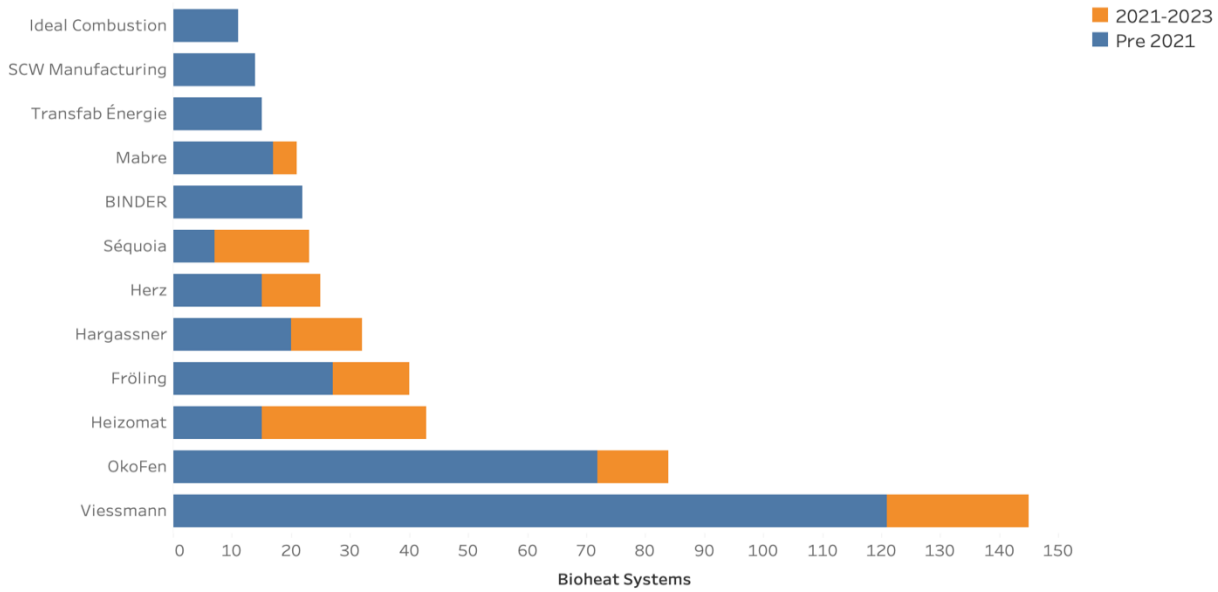

Figure 11: Biomass Boiler Manufacturers with >10 Installations in Canada

3 COMMUNITY BIOHEAT

Rural, remote, Indigenous, and some larger urban communities are realizing the benefits of municipal or band-owned biomass heating infrastructure. Since 2012, the number of community-owned bioheat projects has grown steadily, with development often linked to provincial and federal funding programs that help communities with capital costs for the projects. There are now 105 community-owned bioheat systems operating in 87 communities across Canada. Twenty-six of these were developed since 2021.

More than 80% of communities with community-owned biomass energy systems are rural or remote communities with no access to natural gas, and about 40% are Indigenous (36 of 87). Between 2012 and 2015, more than half of all community-owned projects were developed in Québec, supported by the TEQ residual biomass program. This has changed in recent years and is now more evenly distributed across the country. The federal Clean Energy for Rural and Remote Communities (CERRC) Bioheat program was introduced in 2018 and has been a primary driver of community bioheat in rural and remote communities in Canada.

A total of 26 bioheat projects developed since January 2021 are in Indigenous communities, including two in Saskatchewan where there were previously no projects. Additionally, 57 of the 146 recent bioheat projects are in remote or rural communities, and another 26 are community owned. Approximately 60% of community bioheat projects are fuelled with wood chips, with the remaining balance of projects fuelled with wood pellets. While pellets are a logistically simpler fuel compared to wood chips, an increasing number of communities are opting to establish local wood chip supply

chains, sometimes integrated with broader regional forest operations, due to the local socio-economic and land stewardship opportunities generated. Fuel costs can also drive the decision to choose wood chips.

Interviews with communities who have installed biomass heating systems indicated many benefits that come with successful operation of biomass systems, such as cost savings, potential revenues from district heat customers, local job creation, energy sovereignty and self-sufficiency, education and training of youth and residents on boiler operation and forest management and community pride.

4 CONCLUSIONS

The Canadian bioheat industry is still in its infancy though its growth has remained steady, with a record number of bioheat systems installed in 2021 – likely a pandemic-induced backlog – followed by a return to historical trends since. There is a shift towards larger number of the systems installed being at smaller capacity (<250 kW_{th}). The CERRC Bioheat program has been instrumental in driving growth in bioheat in rural and remote communities and the established supply chains in NT, NB, QC and BC support continued regional growth in those provinces, particularly to displace costly and carbon intense heating oil. The agricultural sector continues to be an important market for small-scale bioheat in QC and ON.

Many participants of the *Bioheat Database* update noted that technology is not the limiting factor as the numerous imported and domestic boiler units are available in the Canadian market. The participants indicated that the lack of awareness of modern biomass heating technologies amongst building developers, municipalities, engineers, etc.; securing/producing consistent, high-quality fuel; public misperception that growth of biomass heating will lead to unsustainable biomass harvest, a fear that is not supported by any relevant science; and boiler regulations which have identified as a hinder in the past though several provinces have updated regulations to accept European standards.

In both Prince Edward Island and the Northwest Territories, where there is very little forest sector activity, governments have strongly supported the establishment of the sector and there are now well-established biomass supply chains to meet the demand. These examples are indicative of the role government support play for initial local/regional market development.

Based upon the results of 2023 Canadian *Bioheat Database* update, several observations and sector trends were identified:

- Canadian bioheat market has been growing steadily since 2008. As of August 2023, there are 646 bioheat projects of which 184 are new additions since the 2021 update. The current total installed capacity is at 481 MWth, an increase of 61 MWth compared to 2021.
- In 2023, industry growth continues to be strongest in QC with 50 new installations. Several other provinces also had strong growth with more than 10 new bioheat systems in NT, BC, ON, NE,

PE, and NS since 2021. At least one new system was installed in all other provinces and territories except Nunavut;

- All new bioheat systems added to 2023 *Bioheat Database* are heat-only (not CHP);
- 83% of all projects are 1 MWth or less, with most larger scale systems heating agricultural buildings, greenhouses, small industrial facilities, or large public facilities such as hospitals and universities;
- Bioheat growth in the private sector (commercial, agricultural, multi-unit residential, and light industrial combined) is now stronger than in the public sector, though institutions continue to provide an important market, particularly outside of QC and NB;
- Agricultural sector has become an important market for small-scale bioheat, with almost a third of bioheat systems installed since 2021 are in this sector;
- European-manufactured boilers are increasingly prevalent in the Canadian bioheat market. These are typically hot water boilers with automated ignition, fuel feed system and ash removal, and have integrated controls (such as recirculation of flue gas, lambda (oxygen) sensors, temperature sensors).
- Wood pellets and wood chips still dominate as the two main types of biomass fuels, with preference regionally specific; and
- 46% of commercial and institutional bioheat systems <5 MW are in a rural or remote community.