



NATURAL RESOURCES CANADA - *INVENTIVE BY NATURE*

# Canadian Bioheat Survey

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*Natural Resources Canada*

*BioCleantech Forum, Ottawa,  
November 3, 2016*

**CanmetENERGY**  
*Leadership in ecoInnovation*



Natural Resources  
Canada

Ressources naturelles  
Canada

Canada

# About CanmetENERGY....

science and technology arm of the  
Innovation and Energy Technology Sector  
of Natural Resources Canada



**CETC - Devon**  
Alberta



**CETC - Ottawa**  
Ontario



**CETC - Varennes**  
Québec



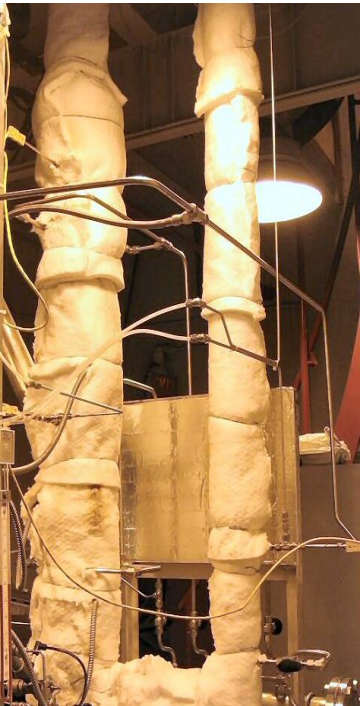
**CanmetENERGY Ottawa leads the  
development of energy S&T solutions for the  
environmental and economic benefit of  
Canadians**

*energy efficiency, renewable and  
alternative energy sources, clean fossil  
fuels*

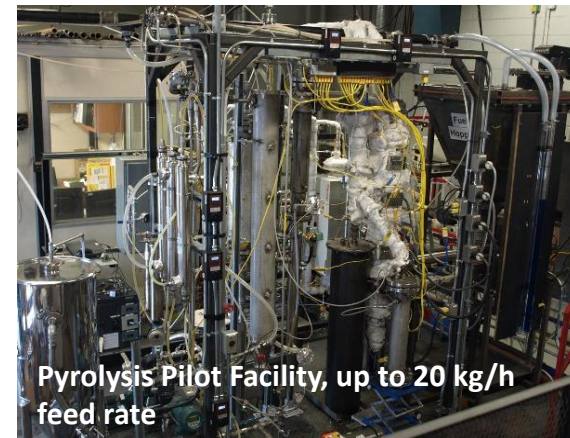
# ...and Bioenergy Program

assists industry to develop cleaner, more energy-efficient biomass conversion processes.

Our in-house research focuses on optimizing the performance of stationary equipment, and, evaluating and developing new products and retrofit technologies for biomass and renewable fuels.



Combustion /  
Gasification Pilot  
Facility, 5 to 20 kg/h



Pyrolysis Pilot Facility, up to 20 kg/h  
feed rate



Rotary Kiln Torrefaction, up to 20 kg/h  
feed rate



# Why heat with biomass fuels?

- Affordable
  - compared to heating oil / propane
- Low carbon fuel
- Highly efficient
  - single conversion step ( $\eta > 80\%$ )
- Scalable
  - pellet stoves to boilers
- Sourced from wood processing industry
  - by-products and residues
- Baseload
- Safe to transport



**Bulk Delivery, BSBHeating, NB**



**Advanced Biomass  
Heating Equipment**



# What is the status of bioheat in Canada?



- ☐ Where?
- ☐ Which sectors?
- ☐ What building types?
- ☐ Which biomass fuels?
- ☐ What boiler size?
- ☐ What is the trend over time?



# Canadian Bioheat Survey



- Target:  
Commercial and institutional market
- Scale range:  
150 kW – 5 MWth
- Interviews vs internet and reports
- Key Data:
  - location, scale, sector, installation date, developers and manufacturers, fuels
- First developed in 2013/2014

*Survey performed by Torchlight BioResources,  
Principals: Jamie Stephen and Jean Blair*

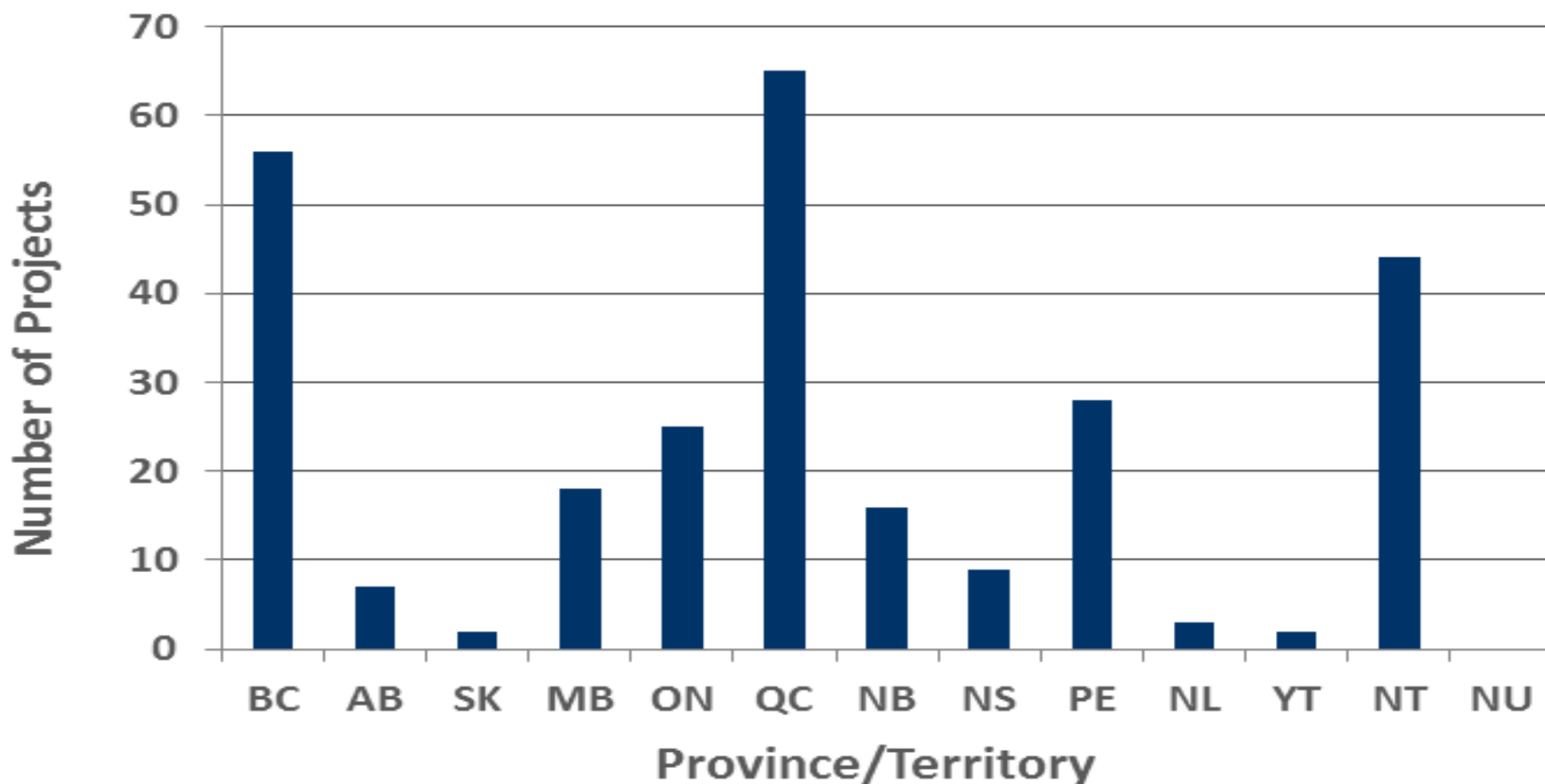
ed by the Minister of Natural Resources, 2016



# Location

**TOTAL of 275 bioheat projects**

QC and BC lead; NWT & PEI greatest growth





# Scale

Larger number of projects regionally concentrated

One successful project leads to others

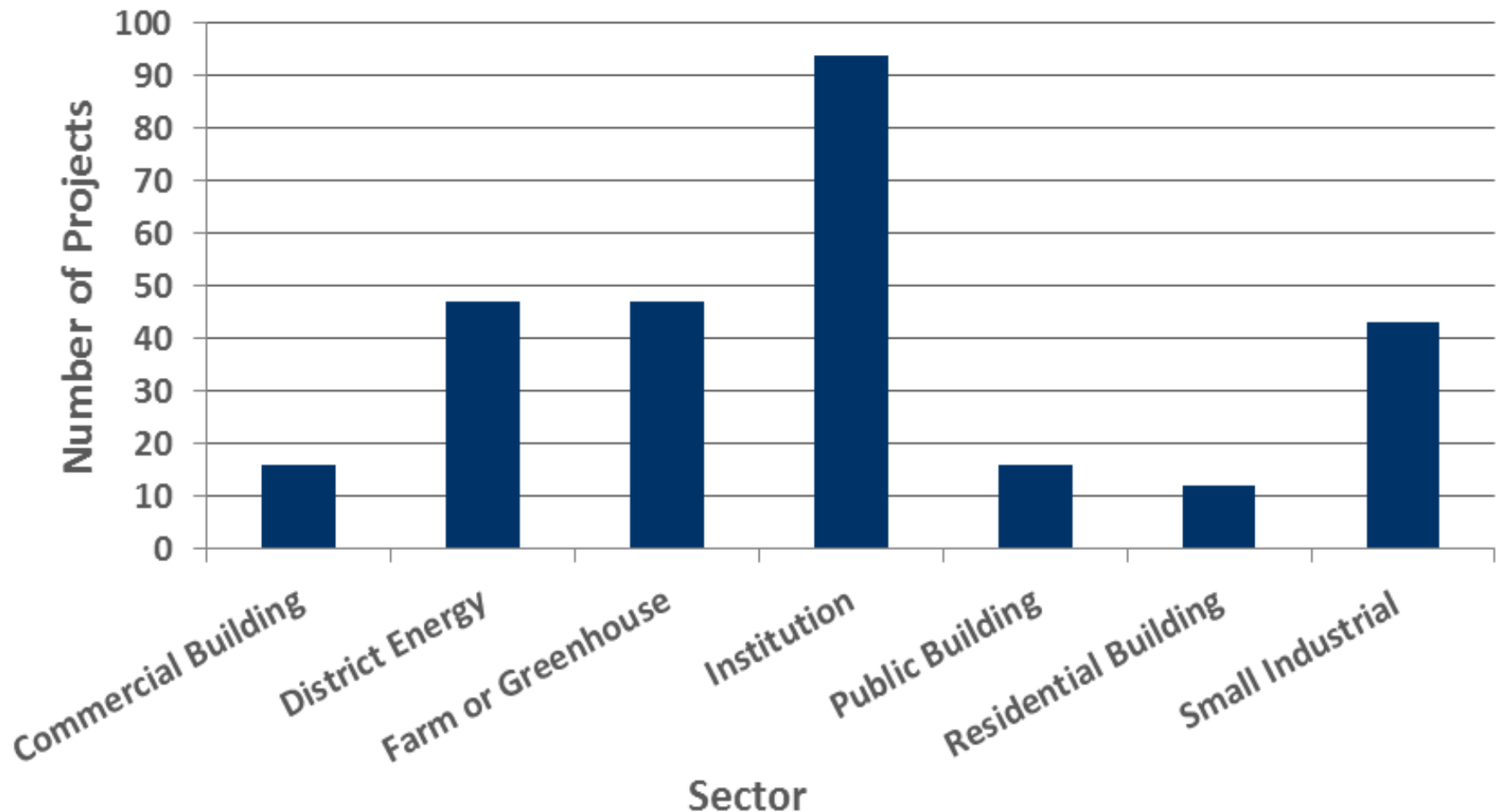






# Sector

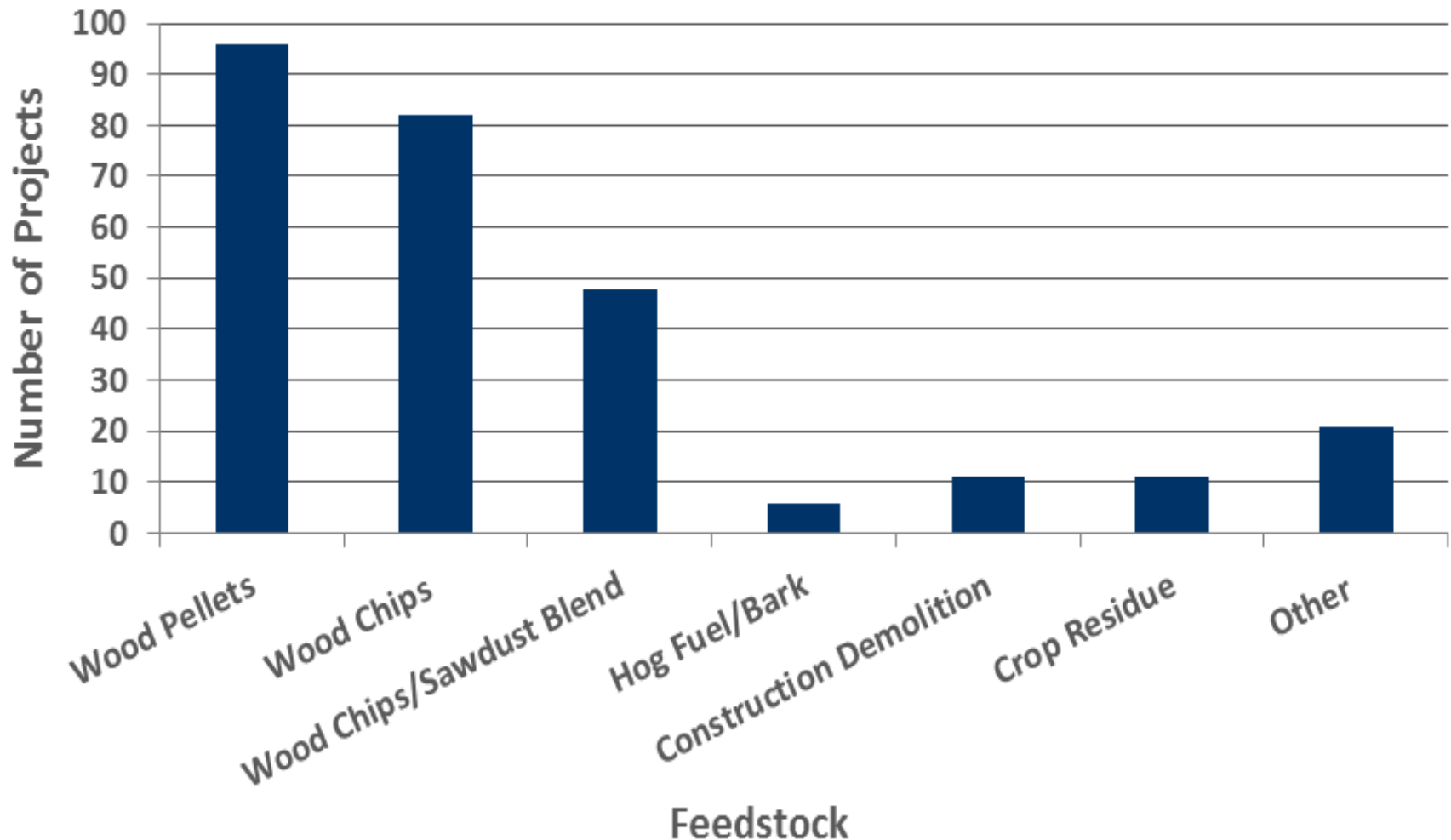
Institutions are the strongest market





# Solid Biofuels

Fuel quality matters: predominantly wood pellets



# Key Findings of Canadian Bioheat Survey 2016

- ~275 bioheat projects across Canada ► an increase of 20% since 2014
- Concentrated growth ► PEI, NWT, QC and BC
- Scale of majority installations < 1MWth
- Strongest markets ► Schools and Hospitals
- Dominant biomass fuels ► Wood pellets and Wood chips
- Bioheat industry growth appears to be influenced by
  - dependence on heating oil
  - supportive policies / regulations
  - established installers / developers
  - not by the feedstock availability
- Few developers/ installers for majority of the new projects





# Examples of Canadian Bioheat Facilities



400 kW pellet boiler,  
Lillooet, BC

2x500 kW wood chip boilers  
Confederation College, Thunder Bay, ON



300 kW wood chips boiler  
Wedgewood Manor , Summerside, PEI



540kW, wood pellet boiler  
District Heating in Behchoko, NWT

# Current Activities at CanmetENERGY

- Solid biofuels standards / technical bulletins
- Equipment performance to fuel quality
- Wood chips quality during storage
- Advance wood pellets – torrefaction, steam explosion, densification

 Natural Resources Canada / Ressources naturelles Canada

## SOLID BIOFUEL STANDARDS

NOW AVAILABLE IN CANADA

What you need to know when buying or selling biomass for heat or power applications.

See the solid biofuels bulletins at [nrcan.gc.ca](http://nrcan.gc.ca)



 Canada 



# SOLID BIOFUEL STANDARDS

NOW AVAILABLE IN CANADA

What you need to know when buying or selling  
biomass for heat or power applications.



Technical Bulletin	Purpose
No.1 – Solid Biomass Fuels	Introduction to biomass and solid biofuels
No.2 – Primer for Solid Biofuels	Guide to definitions, classes/grades and fuel properties
No.3 – CAN/CSA-ISO Solid Biofuels Standards	Detailed listing of CAN/CSA-ISO standards for grading and testing
No.4 – Graded Wood Pellets	Explains fuel specifications as defined in the CAN/CSA-ISO 17225 Part 2
No.5 – Graded Wood Briquettes	Explains fuel specifications as defined in the CAN/CSA-ISO 17225 Part 3
No.6 – Graded Wood Chips	Explains fuel specifications as defined in the CAN/CSA-ISO 17225 Part 4
No.7 – Graded Firewood	Explains fuel specifications as defined in the CAN/CSA-ISO 17225 Part 5

Available at <http://www.nrcan.gc.ca/energy/offices-labs/canmet/5715>



# Natural Resources Canada Solid Biofuels Bulletins

Ressources naturelles Canada / Natural Resources Canada

Bulletin d'information sur les biocombustibles solides n° 1

## BIOCOMBUSTIBLES SOLIDES



Voici le premier d'une série de bulletins d'information portant sur les biocombustibles solides issus de la biomasse ligneuse (biocombustibles solides). Les renseignements fournis proviennent d'une série de normes sur les biocombustibles solides élaborées et publiées par l'Organisation internationale de normalisation (ISO). Les bulletins visent à :

• présenter les différents types de biocombustibles solides qui utilisent des résidus de biomasse ligneuse ;  
• fournir des renseignements sur l'utilisation des biocombustibles solides ;  
• présenter les fabricants de biocombustibles solides ;  
• présenter les sources de biomasse ligneuse principales.

### Qu'est-ce que la biomasse?

Le terme « biomasse » désigne l'ensemble des matières organiques d'origine biologique pouvant provenir de diverses activités, notamment :

- la foresterie et l'arboriculture (aménagement des plantations ligneuses)
- l'agriculture et l'horticulture (culture des plantes)

Ressources naturelles Canada / Natural Resources Canada

Solid Biofuels Bulletin No. 4

## GRADED WOOD PELLETS



This bulletin, fourth in a series, introduces the different grades of wood pellets, their appropriate use and the important parameters that can affect the fuel characteristics. It provides information on the graded wood pellets as specified in the CAN/CSA-ISO 17225 Part 2: Graded wood pellets.

Wood pellets are a highly consistent biomass fuel allowing for easy handling and storage, as well as efficient energy conversion.

As a globally traded commodity, wood pellets are used for space heating in residential appliances, boilers, district heating plants and for electricity generation in large coal-burning power plants.

Wood pellets are small densified cylindrical granules produced by compression of sawdust. As a result, wood pellets are a consistent fuel that can easily be transported and are suited to automated forestry fuel handling systems.

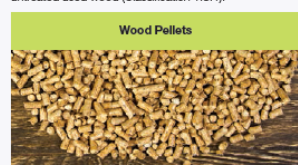
### Origins and Sources

Wood pellets are mainly produced from the by-products of traditional forest operations such as sawmills and finished wood products manufacturing. Harvest residues are also used as raw material though to a much lesser extent. The highest quality sources tend to come from mill and manufacturing residues with little or no bark or ash content.

The CAN/CSA-ISO 17225 Part 2 Standard<sup>1</sup> classifies several grades of wood pellets based on the origin and source of raw materials. Raw biomass used in the production of high grade wood pellets, Grades A1 and A2 (residential or commercial applications), primarily comes from mill residues including sawdust, shavings and cut-offs (Classification 1.2.1) and stem wood (Classification 1.1.3). In addition to the above sources, Grade A2 allows for the use of logging residues (Classification 1.1.4) and whole trees without roots (Classification 1.1.1)<sup>2</sup>.

Sources of the raw biomass impacts fuel specifications. For example, A1 grade wood pellets contain low ash and nitrogen contents, while Grade A2 wood pellets have slightly higher ash and nitrogen content.

Grade B wood pellets are manufactured from more diverse sources, over and above those used for Grade A wood pellets, and can include bark (Classification 1.1.6), residues from thinning, pruning, and arboriculture operations in city parks (Classification 1.1.7), and chemically untreated wood (Classification 1.3.1).



Wood Pellets

Bulletin d'information sur les biocombustibles solides n° 6

## CLASSES DE COPEAUX DE BOIS



Le sixième d'une série de bulletins d'information, lequel présente les différentes classes de copeaux de bois, leur usage approprié, les paramètres importants qui sont susceptibles d'affecter les caractéristiques de ces copeaux. On y fournit de l'information sur les copeaux de bois, selon les précisions de la norme CAN/CSA-ISO 17225-1:2015 Biocombustibles solides - Classes et spécifications des copeaux de bois - Partie 1 : Classes de copeaux de bois.

Les copeaux de bois sont largement utilisés pour le chauffage des bâtiments depuis des décennies. L'adoption est disponible à l'échelle locale et nationale. Cependant, les copeaux de bois s'appuient sur une qualité variable de copeaux de bois (taille, teneur en cendres et en particules fines).

En général, les copeaux sont produits par des usines de la matière première, suivies du tri et du séchage. Le tri est une étape nécessaire pour la qualité voulue de copeaux de bois (taille, teneur en cendres et en particules fines).

### Origine et sources

Principales sources de copeaux de bois sont :

### Résidus ligneux broyés – copeaux de bois



sous-produits et résidus issus des activités de transformation du bois dans le secteur forestier (déchets, écorce ou autres résidus). Ils sont communément utilisés pour la production de copeaux.

Ressources naturelles Canada / Natural Resources Canada

Solid Biofuels Bulletin No. 3

## CAN/CSA-ISO SOLID BIOFUELS STANDARDS

This is the third in a series of bulletins, introducing the CAN/CSA-ISO series of standards on solid biofuels and summarizes details related to fuel classifications, specifications and test methods.

### CAN/CSA-ISO Solid Biofuels Standards at a Glance

The CAN/CSA-ISO Solid Biofuels Standards are voluntary standards developed for residential, commercial and industrial energy applications. Intended stakeholders include:

- Solid biomass fuel producers
- End users and consumers
- Equipment manufacturers
- Testing laboratories
- Regulators.

There are numerous benefits to adhering to these standards. Market adoption of the standards will:

- Facilitate domestic and international trade
- Enhance uptake of new technologies
- Promote public safety and contribute to a more sustainable industry
- Minimize emissions of pollutants
- Facilitate quality assessment of solid biomass resources.

The series of CAN/CSA-ISO Solid Biofuels Standards published in 2015 were developed to standardize the following: terminology; specifications and classes; and test methods for raw and processed biofuel materials originating from forestry, arboriculture, agriculture, horticulture and aquaculture.

Natural Resources Canada's Solid Biofuels Bulletins uses the term "biomass fuels" interchangeably with "biofuels". The CAN/CSA-ISO Standards use the term "biofuels" which is retained in these bulletins when referencing specific standards' titles.

### Development of Solid Biofuels Standards

The International Organisation for Standardization (ISO) established a Technical Committee<sup>3</sup> (TC238) responsible for developing solid biofuels standards at the international level.

- ISO/TC238 is comprised of 24 voting countries and 14 observing countries. Canada is a voting member.
- ISO/TC238 plans to publish 55-60 standards on solid biofuels.



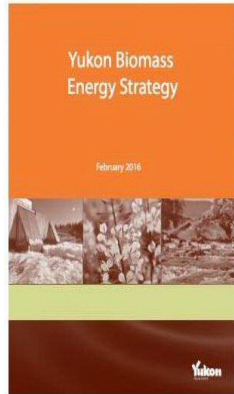
# Bioenergy Strategies ... in the News

## YUKON

Home » Pellets

### Yukon adopts biomass strategy

February 26, 2016 08  
Written by The Government of Yukon



February 26, 2016 - The Government announced the adoption of the Yukon Biomass Strategy which will guide the development of the biomass energy sector in the territory.

"Using biomass is a cost-effective and environmentally sustainable solution for heating in the territory," said Minister of Energy, Mines and Resources Scott Kent.

"The Yukon Biomass Energy Strategy provides good opportunities for the territory to develop a sustainable biomass energy sector."

The strategy provides a framework for the development of biomass energy for heating from local sources. Biomass energy is derived from organic matter. In the Yukon, the focus of the strategy is on wood.

There are six key action items in the strategy:

- using biomass energy for government infrastructure;
- developing regulations, policies and programs for a biomass energy industry;
- managing air quality to protect public and environmental health and safety;
- facilitating the development of a biomass energy industry in Yukon;
- ensuring a sustainable timber supply; and
- ensuring biomass fuel quality and security.

To guide the development of a bioenergy sector

## MANITOBA

Progress on Climate Change

Encourages switching to biomass energy

Coal and Petroleum Coke Ban for Space Heating Regulation

Conservation Minister Gord Mackintosh addresses reporters about the government's ban plan. (CBC)

## QUEBEC

### What is in the Energy Policy 2030?

The new Energy Policy represents a departure from previous ones. It is at the same time far more complex and less detailed than former policies. Previous policies covered shorter periods and focused on additional electricity production and transmission.

The new policy has four primary objectives:

1. to decarbonize Quebec;
2. to reduce energy consumption and improve energy efficiency;
3. to make full use of Quebec's natural resources; and
4. to innovate and develop its green economy.

Reduce by 40% oil products used  
Encourage the use of biomass

greater than in the last 25 years.

The Quebec Government wants renewable energy to meet 61 per cent of Quebec's needs by 2030 (it currently stands at a little more than 47 per cent). Quebec wants to reduce fossil fuel usage, particularly in transportation. Measures will include the electrification of transportation (Quebec has half of Canada's electric cars), the use of natural gas in trucking and the expansion and increased use of public transit (e.g., Montreal's subway is the third busiest in North America after New York and Mexico City).

### Reduction and Efficiency

The Quebec Government wants to eliminate the use of thermal coal and reduce by 40 per cent the quantity of oil products used in the province. Quebec wants to improve by 15 per cent the efficiency with which energy is used. To achieve this Quebec will assist households and industry to reduce energy consumption and expects to spend \$4 billion doing so over the next 15 years. Among other things building codes will be modified and energy efficient renovations encouraged.

### Natural Resources

The Quebec Government will encourage the use of Quebec-sourced energy, including hydro, wind, biomass and geothermal. Households may produce solar and wind electricity and

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