



**CHAR**  
technologies

## Decarbonizing for a Circular Economy

Pyrolysis – Upgraded Biomass as Coal Replacement & RNG

Biochar 2022

August 10<sup>th</sup>, 2022



# FORWARD-LOOKING STATEMENTS

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Statements in this presentation, to the extent not based on historical events, constitute forward-looking statements. Forward-looking statements include, without limitation, statements evaluating market and general economic conditions, and statements regarding future-oriented costs and expenditures. Investors are cautioned not to place undue reliance on these forward-looking statements, which reflect management's analysis only as of the date thereof. These forward-looking statements are subject to certain risks and uncertainties that could cause actual results to differ materially. Such risks and uncertainties with respect to the company include the effects of general economic conditions, actions by government authorities, uncertainties associated with legal proceedings and negotiations, competitive pricing pressures and mis-judgements in the course of preparing forward-looking statements.

# CHAR – WHO WE ARE

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CHAR Technologies Ltd. is a leading cleantech development and environmental services company, which operates as three groups:

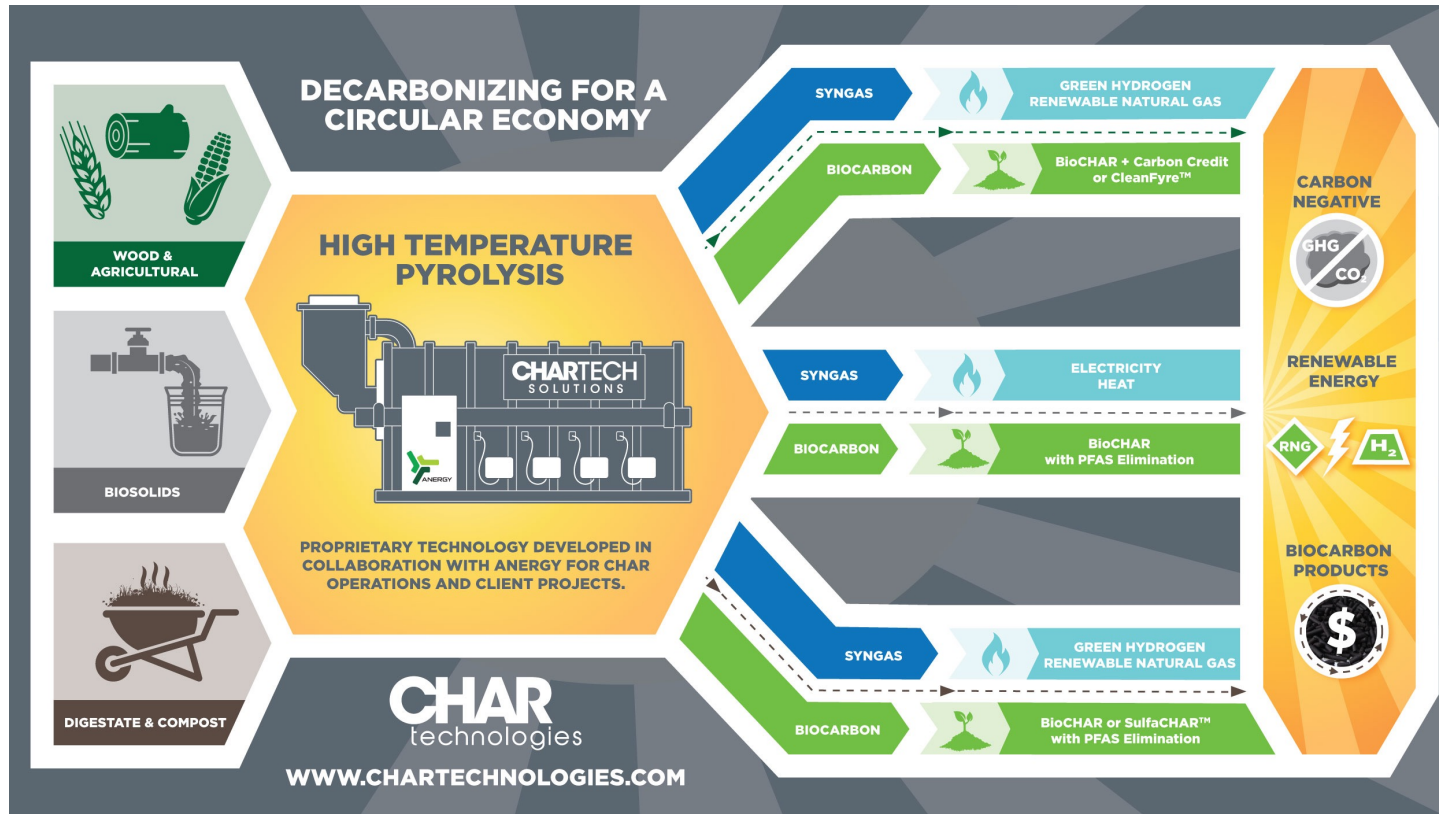
Altech Environmental Consulting Ltd. provides environmental compliance and engineering services

CharTech Solutions delivers advanced industrial clean technologies for clean water, waste reduction and renewable energy

CHAR Biocarbon provides pyrolysis plant operations, biocarbon and green energy gas production as well as pyrolysis products market development, offtake and R&D

The logo for Altech, featuring a stylized green leaf icon to the left of the word "ALTECH" in a bold, dark blue, sans-serif font.The logo for CharTech Solutions, with "CHARTECH" in a bold, blue, sans-serif font and "SOLUTIONS" in a smaller, dark blue, sans-serif font below it.The logo for CHAR Biocarbon, with "CHAR" in a large, bold, dark blue, sans-serif font and "BIOCARBON" in a smaller, dark blue, sans-serif font below it.The logo for CHAR technologies, with "CHAR" in a bold, dark blue, sans-serif font and "technologies" in a smaller, dark blue, sans-serif font below it.A logo for the TSX Venture Exchange, featuring the word "YES" in a bold, white, sans-serif font on a green background, with "LISTED ON" in a smaller, white, sans-serif font below it, and the "TMX" logo and "TSX Venture Exchange" text to the right.

# WHAT IS PYROLYSIS?



# HIGH TEMPERATURE PYROLYSIS (HTP) VALUE



[System Tour/Video](#)

## Carbon Negative

Reduces net greenhouse gas (GHG) emissions.

## Reduce Mass

Reduces organics waste mass by up to 90%.

## Energy Generation

Pyrolysis gas fuels the system, and generates energy.

## Value-Added Outputs

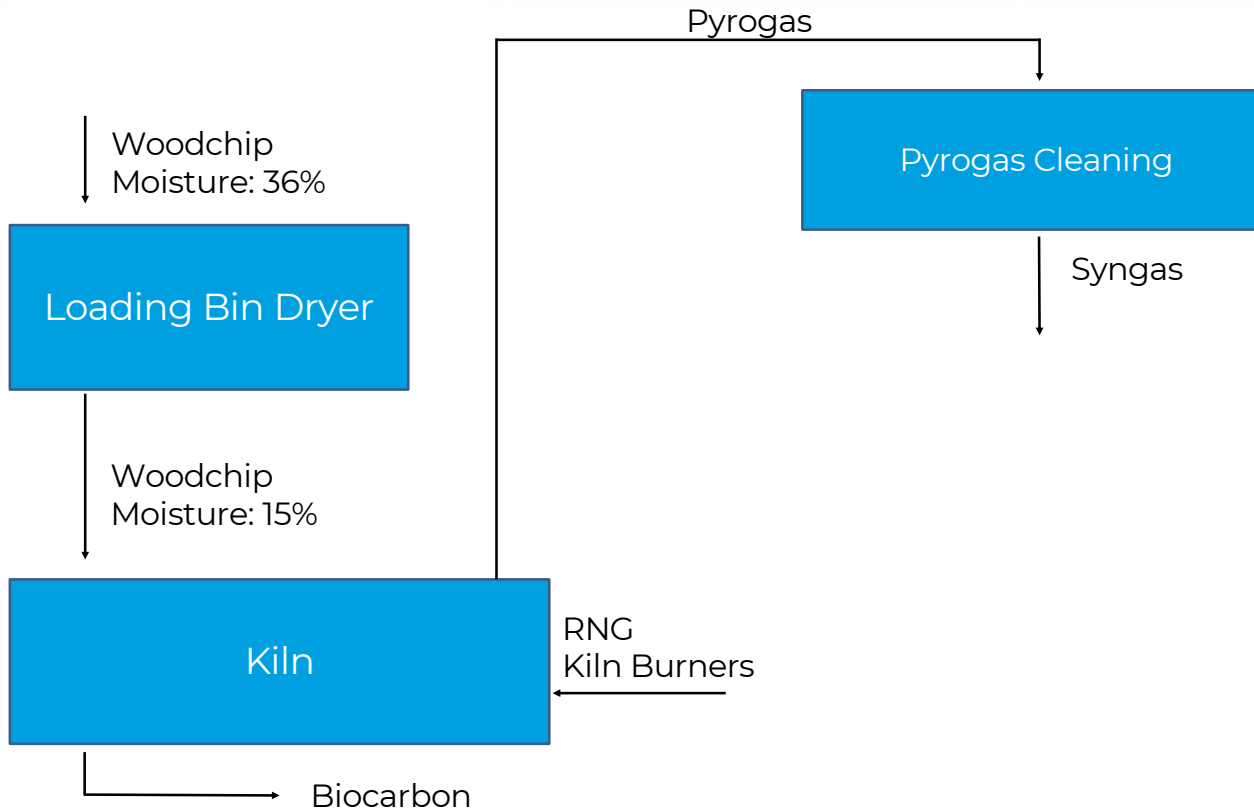
Low-value organic waste streams converted into high value biocarbon products.

CHAR HAS BIOCARBON & PROCESS PATENTS FOR VALUE-ADD PRODUCTS FROM ORGANIC WASTES:

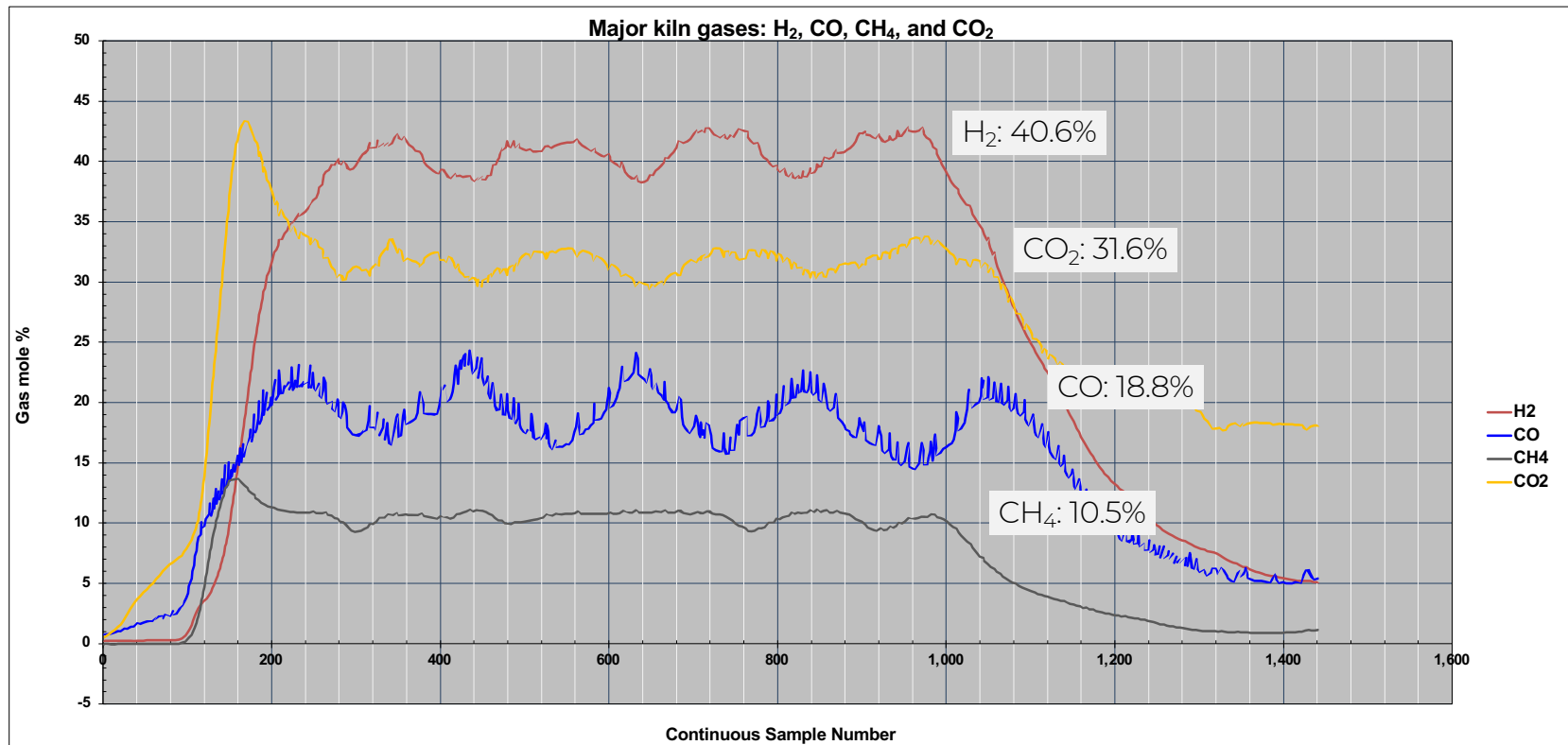


**CLEANFYRE**

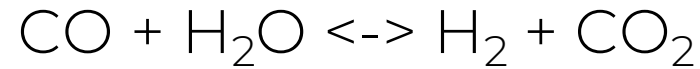
# BOX FLOW – PYROLYSIS TO BIOCOAL & RNG



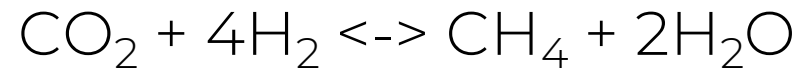
# SYNGAS – TYPICAL MAKEUP



## Water Gas Shift

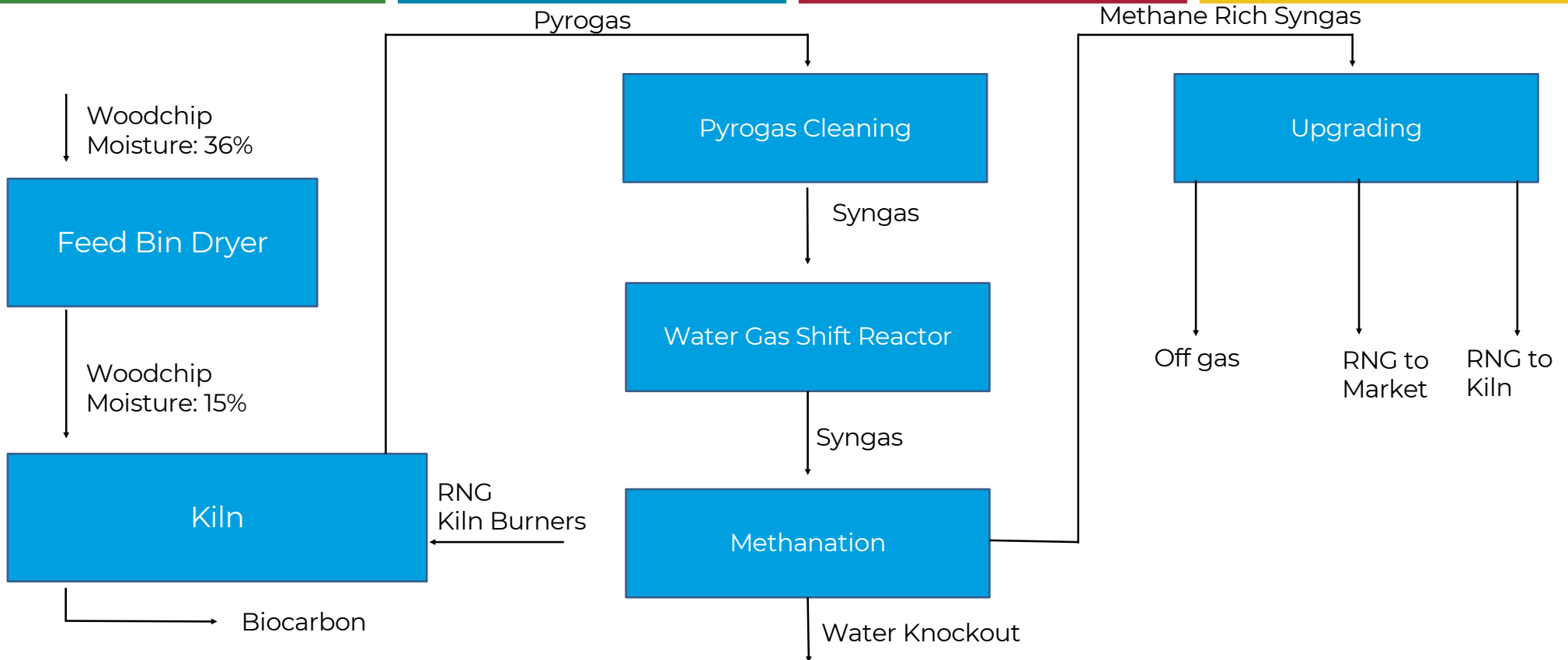


## Methanation





# BOX FLOW – PYROLYSIS TO BIOCOAL & RNG



# YIELDS (WOODY BIOMASS FEED)



## Biocarbon Yield

Mass (Dry Basis) - 23%

Energy - 6.9 GJ/tonne feed

Energy - 5.9 MMBTU/ton feed

## RNG Yield, Gross

Energy - 12.8 GJ/tonne feed

Energy - 11.0 MMBTU/ton feed

## RNG Yield, Net

Energy - 9.0 GJ/tonne feed

Energy - 7.8 MMBTU/ton feed

# INDUSTRY IN TRANSITION



BlackRock is “... removing from our ... active investment portfolios the public securities ... of companies that generate more than 25 per cent of their revenues from thermal coal production.”

- Larry Fink, CEO of BlackRock Inc, January 2020

“Studies assessing Canada's feasible RNG supply have estimated that we could potentially produce 90-218 PJ per year. This amount dwarfs the 6 PJ of RNG that Canada produced in 2019, but is still well shy of the amounts required to meet ambitious RNG targets being set by companies and governments. For context, [Eight Capital] estimate that FortisBC's 15% RNG blending target will require roughly 35-40 PJ of RNG per year.”

- Sean Keane, Eight Capital Report on Cleantech, June 2021

# CLEANFIRE



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March 17, 2021 – Milestone 1,000 Tonne Order

**YES**  
LISTED ON **TMX** TSX Venture Exchange



### Quick Facts:

- 1 tonne coal = 2.9 tonnes GHG
- 1 tonne biocoal replaces 1.1 tonnes coal
- 1 tonne biocoal = 0.27 tonnes GHG
- GHG Pricing = \$170/tonne by 2030
- In 2030, 1 tonne of coal will cost an extra \$496

### CleanFyre v.s. Anthracite Coal:

Fuel	Energy Value	GHG Emissions
CleanFyre	32 MJ/kg (13 000 BTU/lb)	0.27 tonnes of CO <sub>2</sub> /tonne
Anthracite coal <sup>1</sup>	29 MJ/kg (12 000 BTU/lb)	2.9 tonnes of CO <sub>2</sub> /tonne

- 1 tonne of CleanFyre replaces 1.1 tonnes of Anthracite, reducing net GHG emissions by 2.90 tonnes of CO<sub>2</sub> per tonne of fuel

# BIOCOAL – KEY CLIENT CONSIDERATIONS



**Use:** Thermal (brown) coal replacement, or metallurgical coal replacement?

**Energy Density:** Anthracite is 29 MJ/kg (12,000 BTU/lb)

**Ash Content:** Anthracite is < 5% - limits feedstock choices

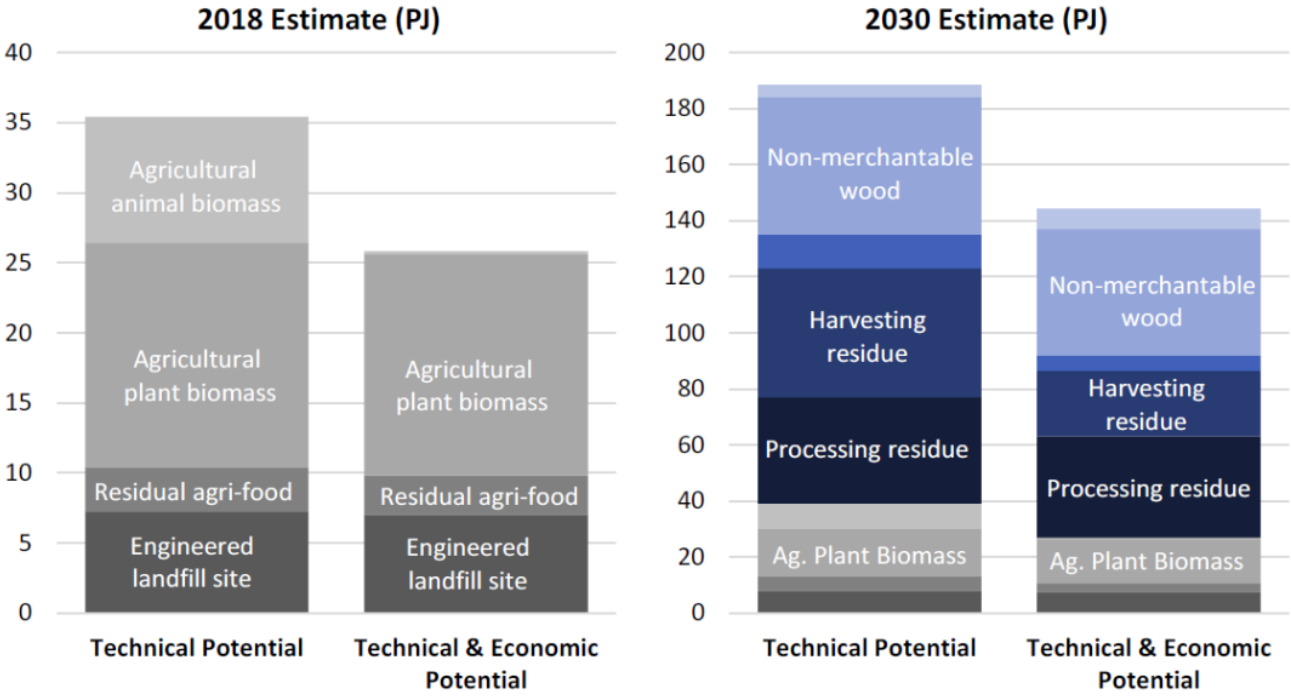
**Logistics:** Pelletize for transport? If so, grindability to powder for use in existing infrastructure

# RNG & DEMAND

Region	Company	Target RNG Blending %	Target Year	PJ/Yr	Million MMBTU/yr
British Columbia	Fortis	15%	2030	36	34.1
Québec	Énergir	10%	2030	21.5	20.4
California	SoCalGas	20%	2030	144	136.8
Oregon	NW Nat.	15%	2030	42.3	40.1
Vermont	VGS	20%	2030	2.87	2.7

In the USA, 157 operational biogas to RNG projects in 2020 produced over 59 million MMBtu, the equivalent of over 459 million gallons of diesel

# WHERE WILL THE RNG COME FROM (QUÉBEC)?



1 PJ = 947,817 MMBTU

*Deloitte & WSP for the Government of Québec*



# BIOMASS AVAILABILITY

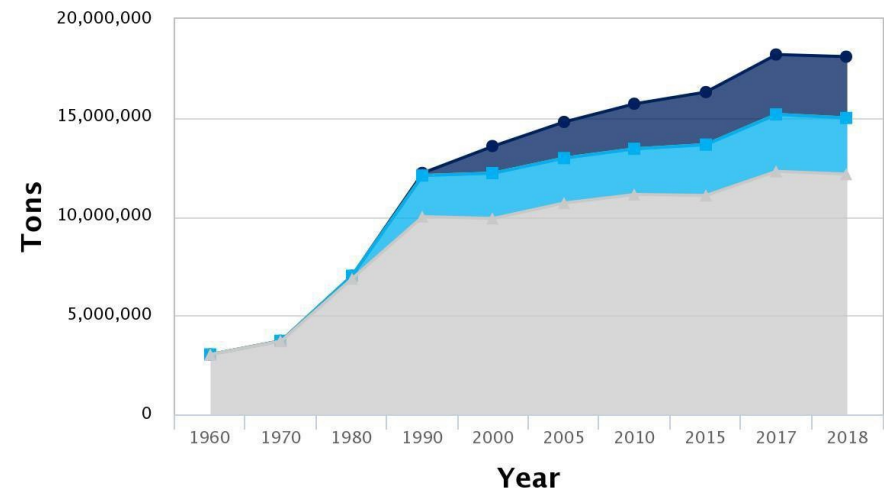
There is tremendous opportunity for CHAR to capitalize on energy recovery from the majority of wood waste currently going to landfill.

The data shown below relates to the total number of tons of wood waste generated, recycled, composted, combusted with energy recovery and landfilled.

1960-2018 Data on Wood in MSW by Weight (in thousands of U.S. tons)							
Management Pathway	1960	1970	1980	1990	2010	2015	2018
Generation	3,030	3,720	7,010	12,210	15,710	16,300	18,090
Recycled	-	-	-	130	2,280	2,660	3,100
Combustion with Energy Recovery	-	10	150	2,080	2,310	2,570	2,840
Landfilled	3,030	3,710	6,860	10,000	11,120	11,070	12,150

Source: Center for Forest Products Marketing and Management (Virginia Polytechnic Institute).

**Wood Waste Management: 1960-2018**



Click on legend items below to customize items displayed in the chart

- Recycled
- Composted
- Combustion with Energy Recovery
- Landfilled

# CI FOR RNG & BIOCARBONS FROM HTP

	Base Case			
CI, RNG Only (gCO <sub>2,eq</sub> /MJ)	3.9	3.9	3.9	3.9
% Biocoal	80%	100%	80%	0%
% Biochar	20%	0%	20% <sup>1</sup>	100%
CI, Biocarbons (gCO <sub>2,eq</sub> /MJ)	-62.8	-77.3	-61.8	-5.1
Total CI (gCO <sub>2,eq</sub> /MJ)	-58.9	-73.4	-57.9	-1.2

<sup>1</sup>Assuming no CI credit for biochar

- Calculated using GHGenius, 3<sup>rd</sup> party reviewed
- Calculated on a “lifecyle basis” – includes transportation and preparation (grinding) of wood



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Andrew White, CEO  
[andrew.white@CHARtechnologies.com](mailto:andrew.white@CHARtechnologies.com)

