Biomass Upgrading to Biocoal & RNG Using High-Temperature Pyrolysis (HTP)

2024 International Biomass Conference & Expo

March 6th, 2024

CHARTECH

Forward Looking Statements

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 and expected revenue. 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. Readers are cautioned that there can be no assurance that the Company will be able to enter into definitive agreements for, or otherwise proceed with or realize upon, the potential opportunities referred to in this presentation on timely basis or at all, nor that the nature and scope of such potential opportunities will ultimately be as described herein or as to the extent of any financial, operational or other benefits which may be realized by the Company in proceeding with such potential opportunities.

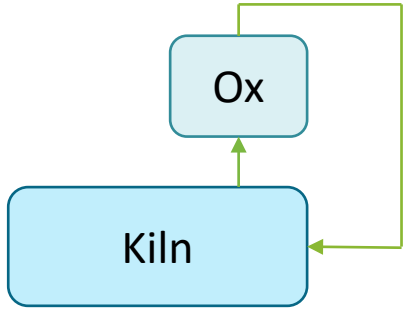
The forward-looking information contained in this presentation represents management's expectations as of the date of this presentation and is subject to change after such date. However, we disclaim any intention or obligation or undertaking to update or revise any forward-looking information whether as a result of new information, future events or otherwise, except as required under applicable securities laws in Canada.

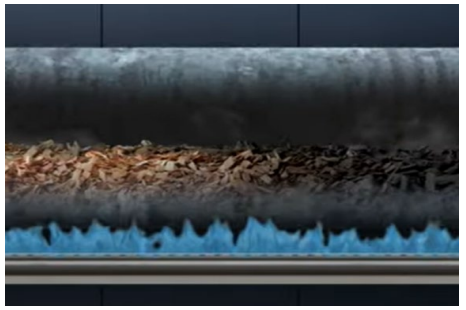
Forward-looking information is necessarily based on a number of opinions, estimates and assumptions that management considered appropriate and reasonable as of the date such statements are made, and is subject to known and unknown risks, uncertainties, assumptions and other factors that may cause the actual results, level of activity, performance or achievements to be materially different from those expressed or implied by such forward-looking information, including but not limited to those described under the heading "Risk Factors" in our 2022 annual MD&A for the fiscal year ended September 30, 2022.

We caution that the list of risk factors and uncertainties under the heading "Risk Factors" is not exhaustive and other factors could also adversely affect our results. Readers are urged to consider the risks, uncertainties and assumptions carefully in evaluating the forward-looking information and are cautioned not to place undue reliance on such information.

Thermal Processing Definitions (as we see things)

Attributes	Combustion	Gasification	Standard Slow Pyrolysis	High Temperature Pyrolysis
Temperature Range	300°C - 700°C	700°C – 1,500°C	450°C - 650°C	750°C - 950°C
Amount of Oxygen	Oxygen rich	Oxygen limited	Oxygen free	Oxygen free
Source of Heat	Direct burning	Direct burning of syngas/biomass in reactor	Indirect, pyrolysis gas burned externally, hot exhaust circulated	Indirect, pyrolysis gas cleaned, burned in burners adjacent to heat tube





HTP Benefits

- High degree of temperature control
  - Different heating zones (important for both biocarbon quality and syngas quality)
  - Can maintain temperature specifications if moisture content of feedstock varies

- Excess of high quality syngas is produced
  - Potential oils/tars crack within reactor, converted to additional gas
  - Used directly for local thermal loads
  - Extract green hydrogen
  - Convert to renewable natural gas
  - **Extract maximum value from biomass**

Active Projects (In Construction)

CHAR Tech Thorold

Input: Clean Woodwaste (Grade A)
Outputs:
- 10,000 Tonnes/yr Biocarbon (biocoal)
- 500,000 GJ/yr Renewable Natural Gas (RNG)

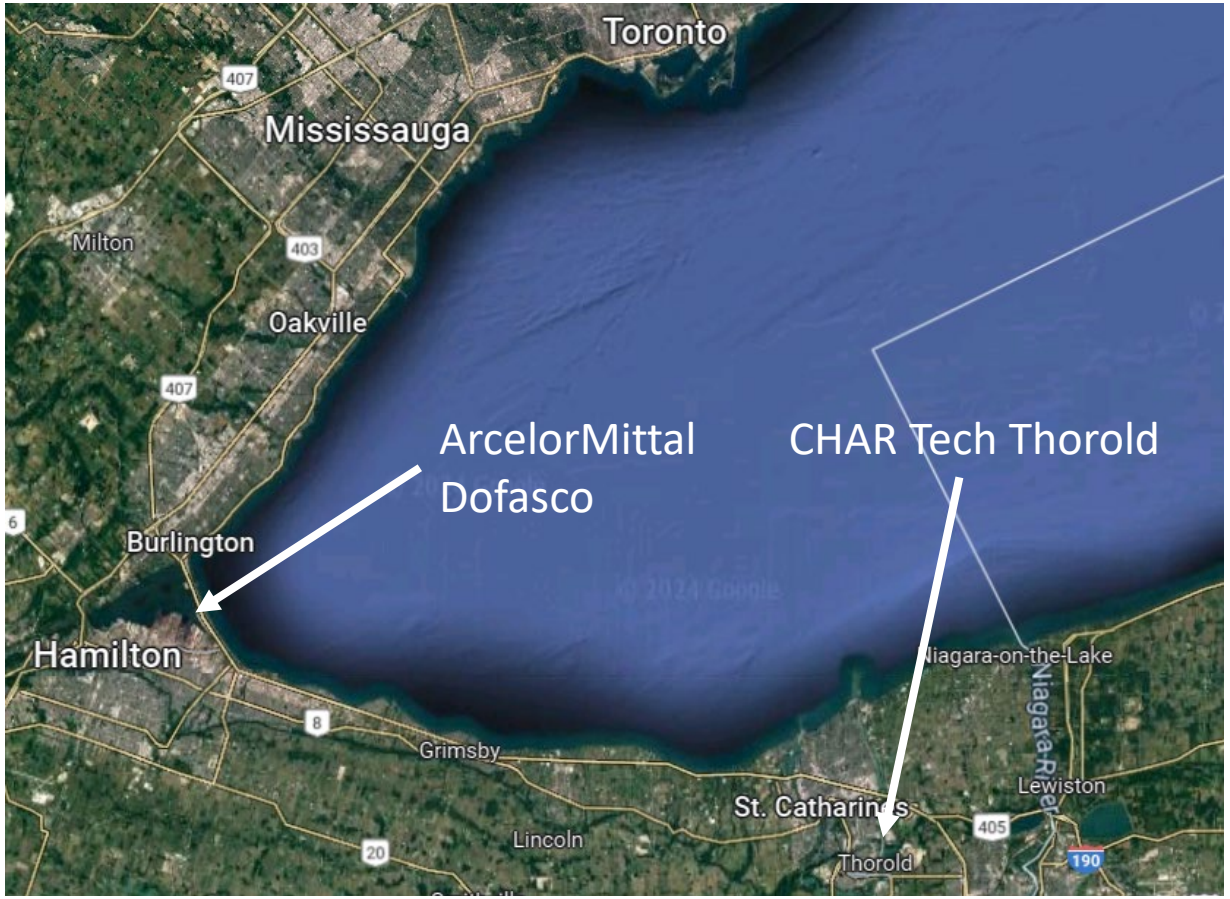
Initial Operations:
Summer 2024

Synagro

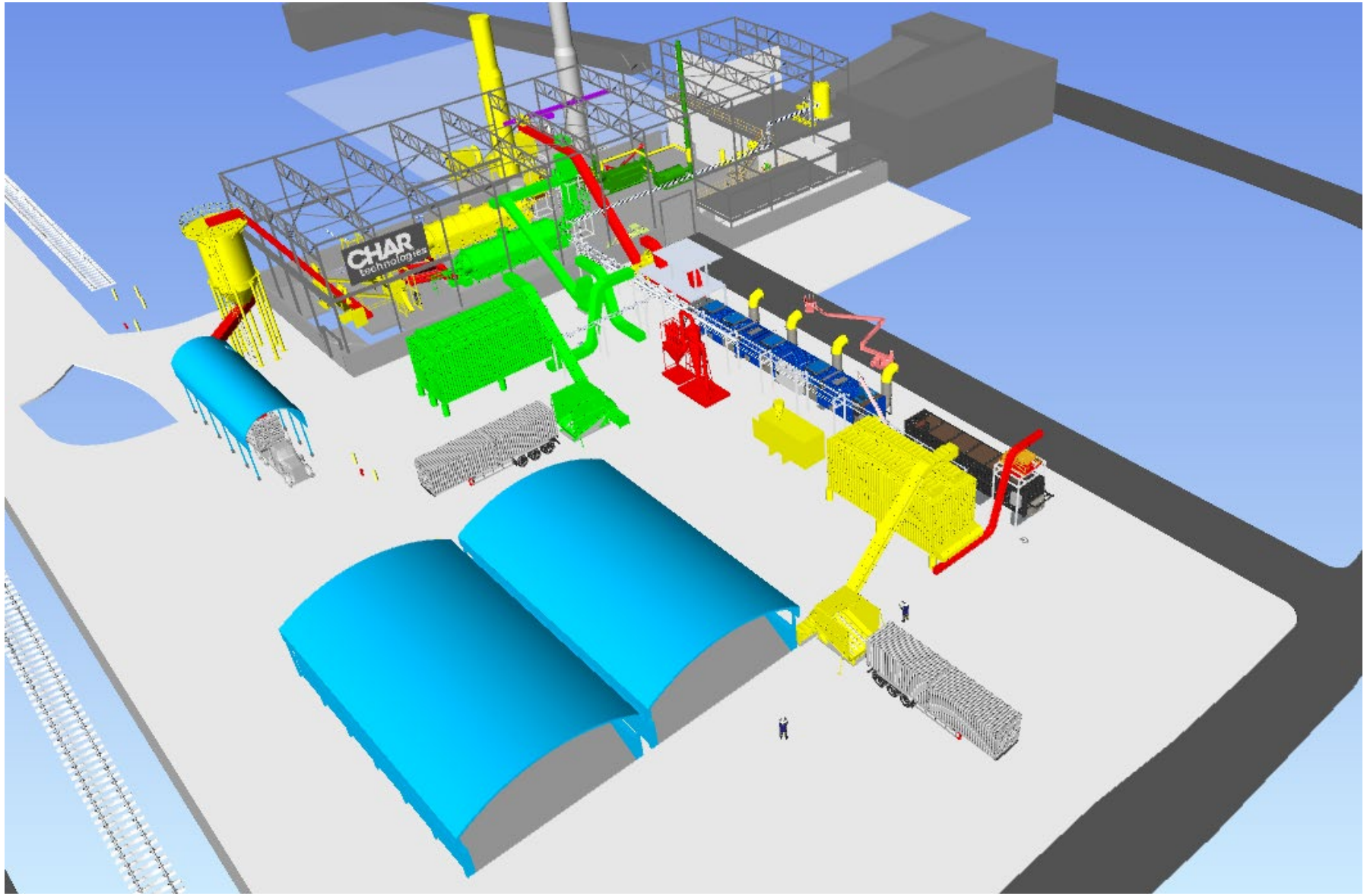
Input: Dried biosolids
Outputs:
- PFAS destruction
- Biochar
- Clean syngas for thermal applications

Initial Operations:
Summer 2024

Thorold Location



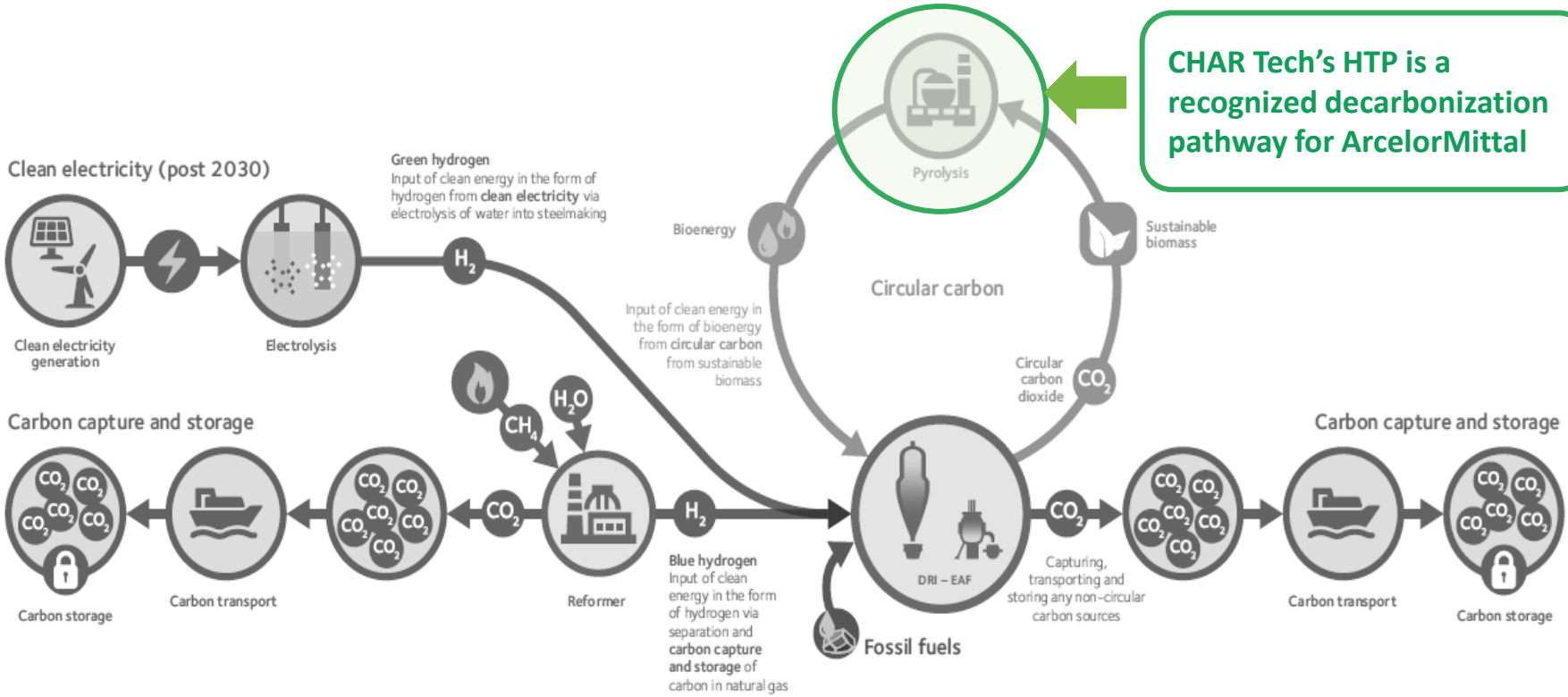
Thorold Layout



Strategic Partnership with ArcelorMittal to Replace Met. Coal

ArcelorMittal

- ✓World's leading steel and mining company
- ✓Invested $6.6M equity in July 2023
- ✓ArcelorMittal is the offtaker of CHAR's Thorold biocoal
- ✓CHAR Tech is the only Canadian company selling biocoal to steelmakers regularly



ArcelorMittal Climate Action Report 2 – July 2021

Biocarbon / Metallurgical Biocoal Considerations

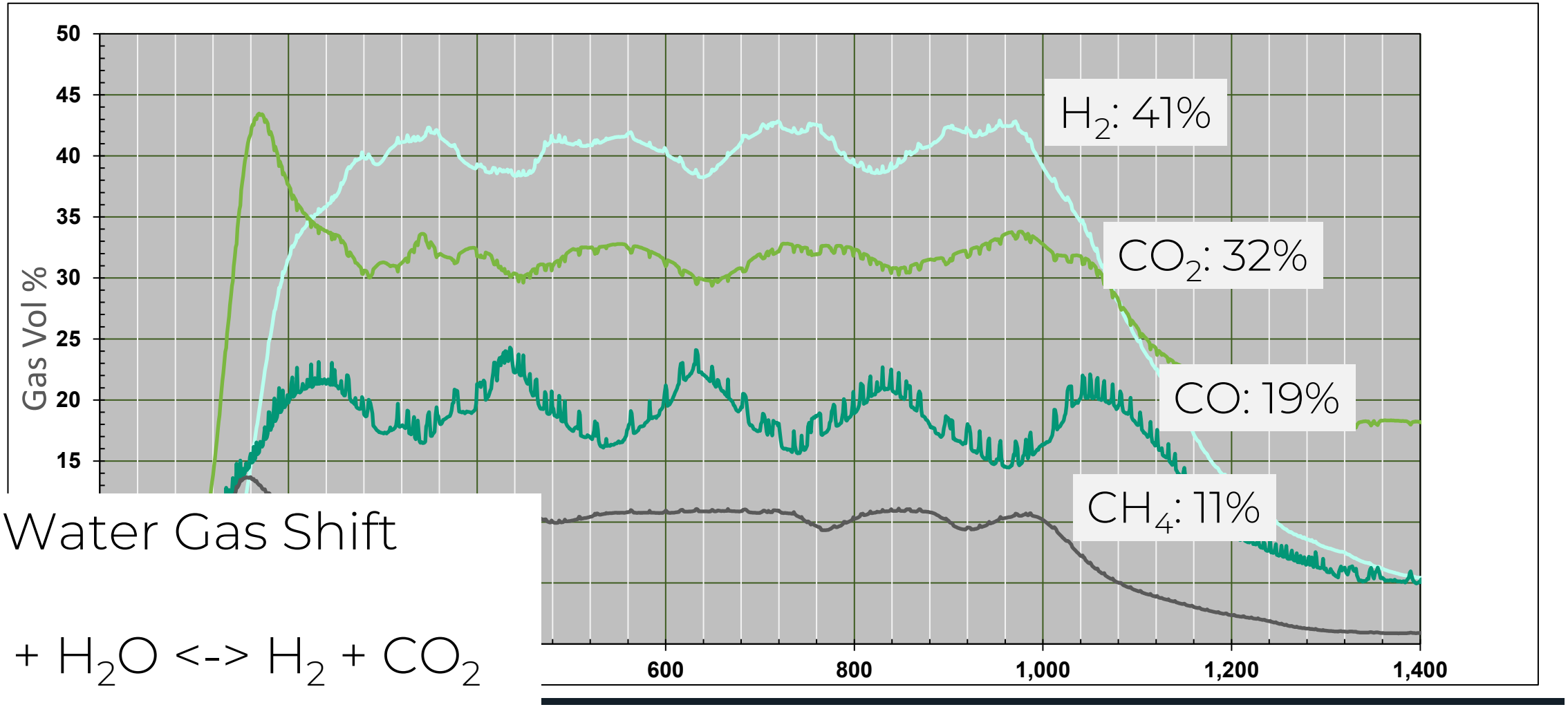
Generally:

- High fixed carbon (> 85%)
- Low ash (< 10%), specific ash components may have very low tolerances
- Low VM (< 10%)
- High energy density (> 29 MJ/kg, > 12,000 BTU/lb)
- Form/granulometry
  - Powder?
  - Pellets? What binders are acceptable?
  - Other density/shape limitations

Specifics for use cases:

- Steelmaking blast furnace (PCI vs Coke/burden)
- Steelmaking EAF
- Metal smelting (copper, nickel, aluminum, etc)

Syngas Characteristics from HTP



Water Gas Shift

$CO + H_2O <-> H_2 + CO_2$

Methanation Chemistry

Water Gas Shift

$$CO + H_2O <-> H_2 + CO_2$$

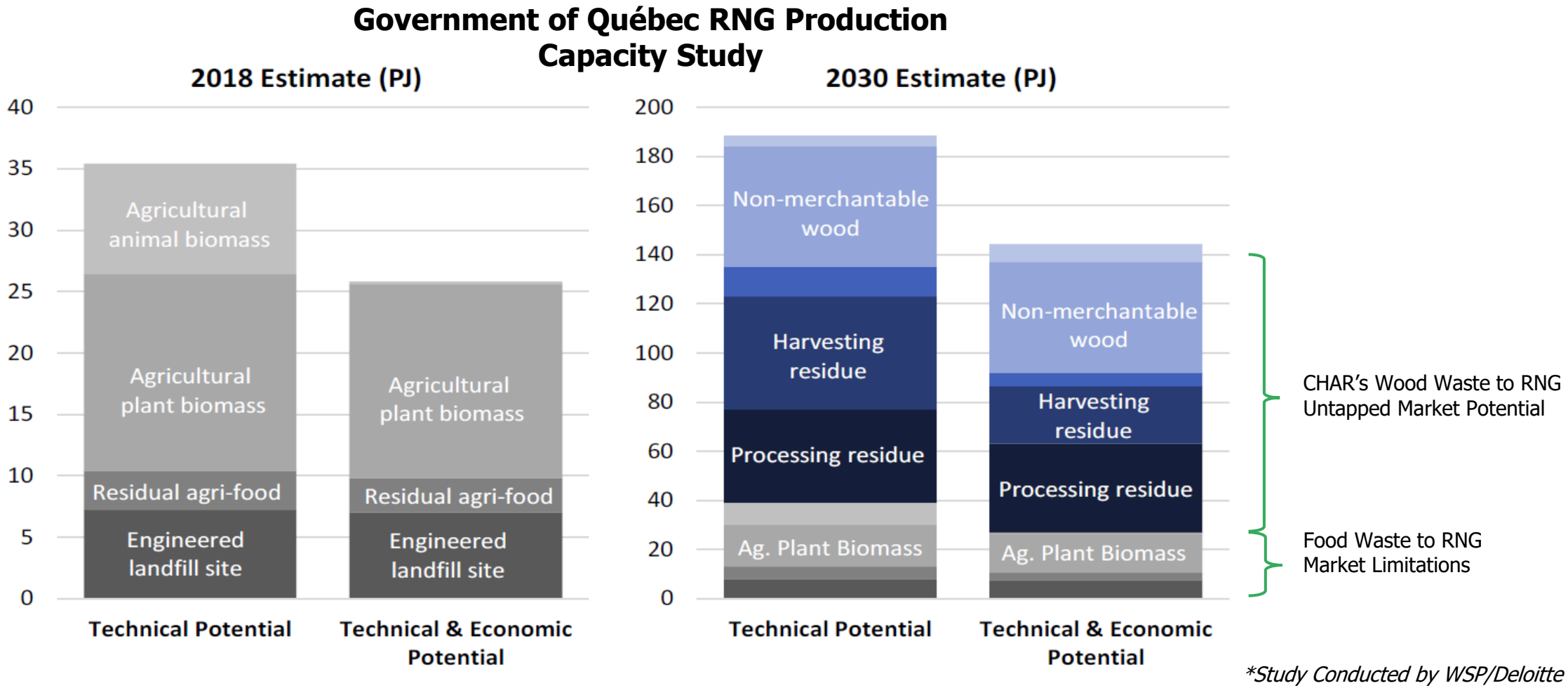
Methanation

$$CO_2 + 4H_2 <-> CH_4 + 2H_2O$$

RNG Sells at a Large Premium to Natural Gas

- Utilities such as Enbridge and Énergir are signing 20-year RNG sales agreements with RNG producers, like CHAR, between $21-$45 per gigajoule (GJ)
- CHAR Tech's Thorold facility will produce 500,000 GJ in 2025
- CHAR Tech's pipeline of projects lays out the pathway for over 3M GJ of RNG production

Opportunities for RNG & Biocarbon



*Study Conducted by WSP/Deloitte

Non-Dilutive Government Funding for Desrisking

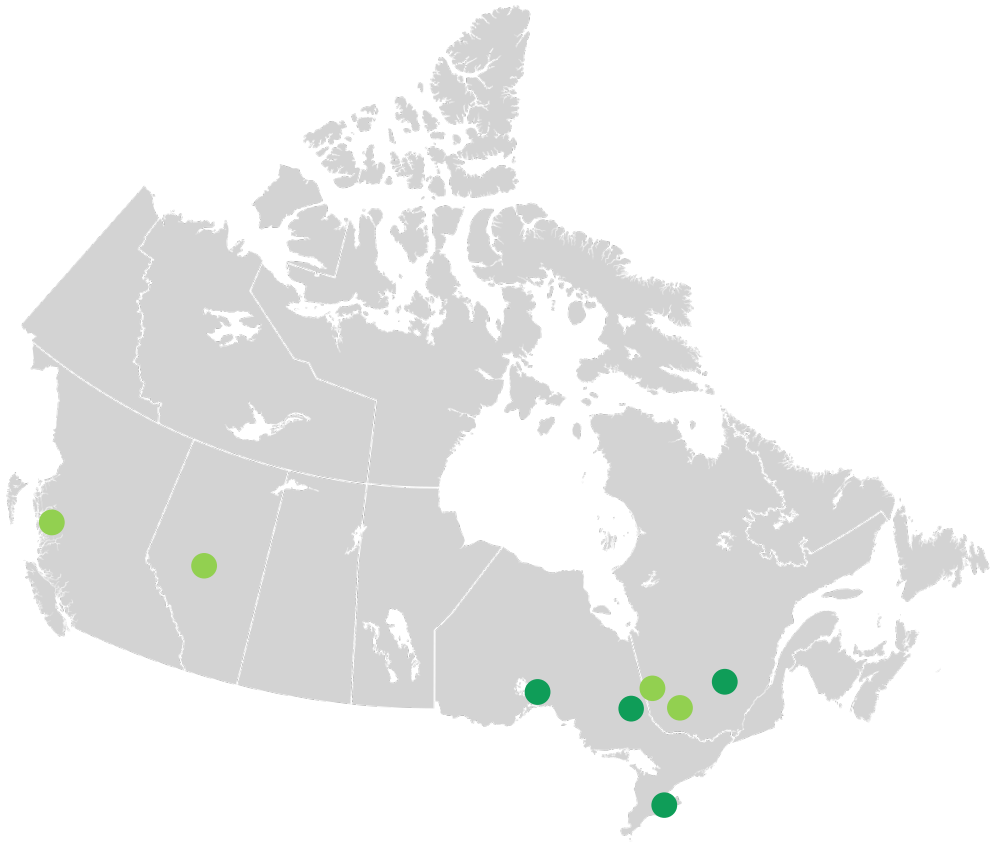
Government of Canada / Gouvernement du Canada

Canada Ontario

$14.2M invested in CHAR Tech since 2022 to accelerate growth

- Important for early industrial adoption to see elements of the project/process derisked.

Scaling Up → Modular Growth Approach



Project	RNG (GJ/yr)	Biocoal (tonnes)
In Development		
Thorold, ON	500,000	10,000
Kirkland Lake, ON	500,000	10,000
Lake Nipigon, ON	500,000	10,000
Saint-Félicien, QC	250,000	5,000
Feasibility Study Funding Secured		
Terrace, BC	500,000	10,000
Drayton Valley, AB	500,000	10,000
La Sarre, QC	250,000	5,000
Amos, QC	250,000	5,000

Biomass Feedstock Grades

Can you make biocarbon out of this?
Maybe…

Biomass Grades (Emerging/Proposed)

Wood Waste/Residual Category	Description
Grade A Clean Wood Waste/Residual	Clean wood waste is not treated with chemicals (e.g., for pressure treatment), paint, stained or other coatings and is free of glue. It would include processing residuals such as; tree stumps (whole or chipped), trees, tree limbs (whole or chipped), bark, sawdust, chips, scraps, slabs, hog fuel, millings, shavings and pallets made from clean hard and soft wood.
Grade B Engineered Wood Waste	Engineered (composite) wood refers to manufactured plywood, medium & high density fiberboard, particle board, oriented strand board, veneers, etc. Grade B wood waste is typically contaminated with glues and resins and could include nails and metal plates.
Grade C Painted Wood Waste	Painted wood contains a coating (e.g., paint, varnish, sealer, stain) applied onto or impregnated into clean, engineered or treated wood. It includes trim, doors, cabinets, flooring, some siding, balustrades and baseboards. Some painted wood may contain hazardous or toxic substances and because it may be difficult to test the type of paint, it is usually not possible to divert from landfill.
Grade D Treated Wood Waste	Treated wood refers to wood that is pressure treated or coated with chemical preservatives to protect it against decay, mould and insects. Treated wood includes railway ties, utility poles, fencing and wood for exterior application and products that have been treated with stains and preservatives. These wood wastes which are typically heavily contaminated with chemicals and inorganic materials would be classified as hazardous waste.

Importance of Grades

- In addition to chemistry, provides guidelines for suppliers as to what is acceptable
  - Fixed carbon, ash, moisture content, volatile matter more difficult to ascertain visually (although important factors in a properly implemented QA/QC program)
  - Depending on product/output specs, various amounts of various Grades could be allowed
- Permitting
  - Permissible contamination (i.e., 1% Grade B allowable?).
- Allows for more proper contracting of supply, important factor in project financibility (covered by others at this conference)

Thank You!

MORE **ABOUT US**

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