High Temperature Pyrolysis (HTP) Technology
January, 2023

Decarbonizing for a Circular Economy

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. 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.

WHO WE ARE

CHAR Technologies Ltd. operates as three groups:

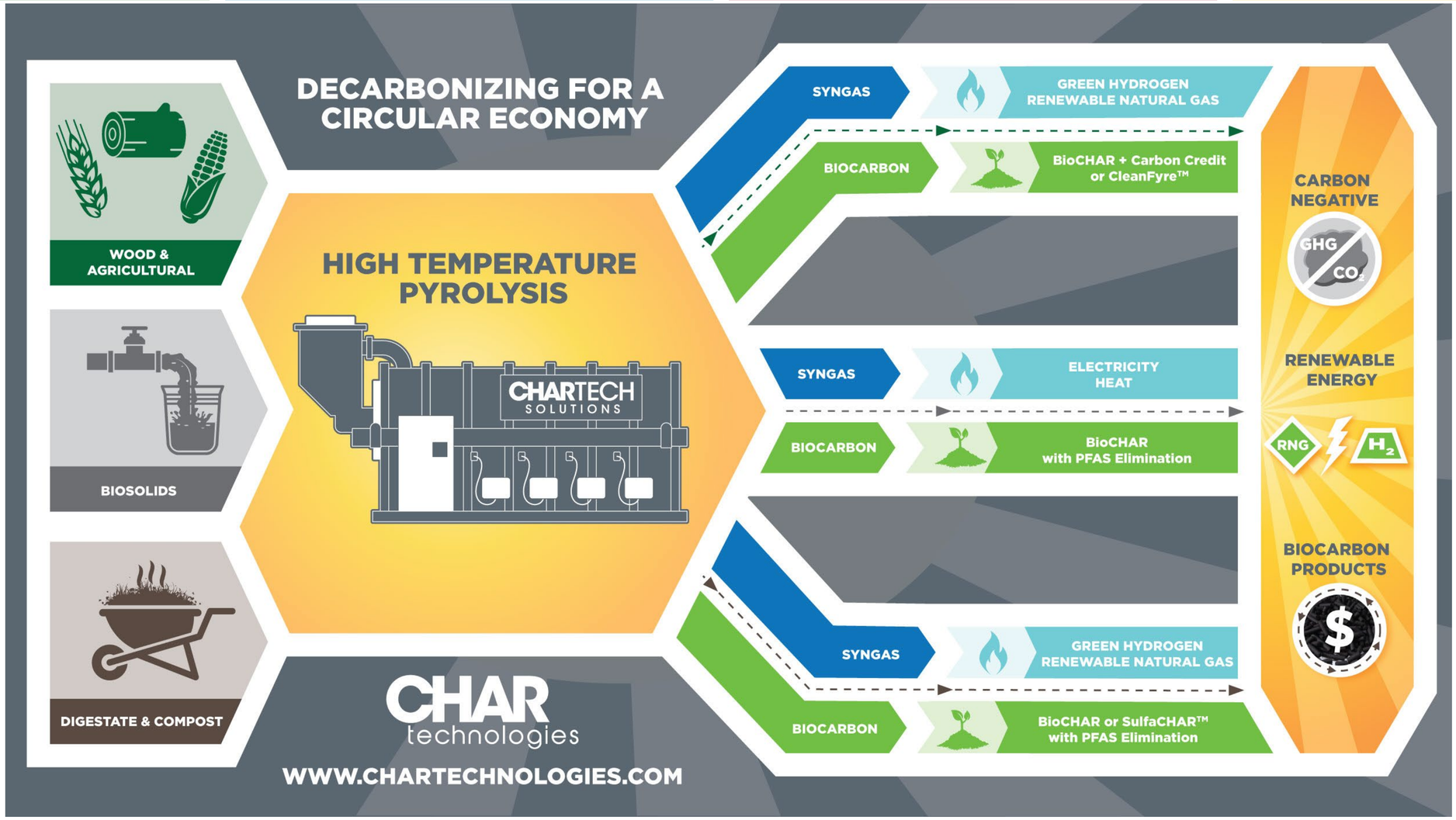
Altech Environmental Consulting Ltd. provides environmental compliance and engineering services

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

HIGH TEMPERATURE PYROLYSIS (HTP)

CHARTECH SOLUTIONS



ACTIVE PROJECTS

San Luis Obispo, California

- Add-on to existing Hitachi Zosen Inova facility
- Process 18,000 tons per year solid anaerobic digestate
- Produce biochar (soil amendment & carbon credits)
- Produce green hydrogen
- In Development

Saint-Félicien, Québec

- Adjacent to Greenleaf Power's biomass cogeneration facility
- Process 36,000 tonnes per year woody biomass
- Produce biochar (soil amendment & carbon credits) & biocoal
- Produce syngas (initially) for power, followed by RNG
- In Development

Thorold, Ontario

- Adjacent to sawmill operations in Archer Drive industrial park
- Process 72,000 tonnes per year woody biomass
- Produce biochar (soil amendment & carbon credits) & biocoal
- Produce RNG
- In Construction (biocarbon pilot currently operating)

CHAR HTP VS. GASIFICATION

High Temperature Pyrolysis (HTP)

- ✓ Oxygen-free, thermochemical conversion
- ✓ High-calorific value gas = no steam cycle addition
- ✓ High fixed carbon, low ash = high value biochar
- ✓ Operationally reliable in harsh conditions
- ✓ Compact footprint & lower CAPEX/OPEX

Gasification

- ✗ Oxygen, incomplete combustion
- ✗ Low-calorific value gas = steam cycle addition
- ✗ Low fixed carbon, high ash = low value biochar
- ✗ Reliability & operational challenges
- ✗ Large footprint & higher CAPEX/OPEX

HIGH TEMPERATURE PYROLYSIS (HTP) VALUE

CHARTECH SOLUTIONS

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:

SulfaCHAR™ CATALYTIC DESULFURIZATION

CLEANFYRE

BIOCARBON APPLICATION – BIOCOAL

CLEANFYRE

- Produced from high temperature pyrolysis of wood waste between 600 – 800 °C
- Replaces fossil fuel coal in applications such as steel, cement and smelting processes
- CHAR recently received a 1,000-tonne order from one Canada's largest steel producers

CleanFyre v.s. Anthracite Coal:

Fuel	Energy Value	GHG Emissions
CleanFyre	32 MJ/kg (13 000 BTU/lb)	0.27 tonnes of CO_2/tonne
Anthracite coal[1]	29 MJ/kg (12 000 BTU/lb)	2.9 tonnes of CO_2/tonne

- 1 tonne of CleanFyre replaces 1.1 tonnes of Anthracite, reducing net GHG emissions by 2.90 tonnes of CO_2 per tonne of fuel

BIOCARBON APPLICATION – ADSORBENT

- SulfaCHAR as an adsorbent supplement can be valued at **$1000 CAD/t biocarbon**
- SulfaCHAR can also generate additional value as a sulfur-rich fertilizer, at **$500/t biocarbon**

Feedstock

Low value digestate or compost.

Production

High Temperature Pyrolysis (in the absence of oxygen). The secret sauce (IP protected).

Use

Add SulfaCHAR into a vessel for gas to flow through for supplemental H_2S & odour treatment.

End-of-Life

Sulfur-rich biochar fertilizer. University of Guelph validated enhanced corn growth using SulfaCHAR.

BIOCARBON APPLICATION – BIOCHAR/FERTILIZER

- Produced from organic feedstocks to create a high-value biochar/fertilizer
- Benefits:
  1. Retains water in dry soils
  2. Improves soil structure
  3. Sequesters carbon in the ground
  4. Holds nutrients in the soil
  5. Reduces odour
- Valued at **$200-400 CAD/t biocarbon**

Water retaining

Carbon-adding

Nutrient holding

Biochar/Fertilizer Carbon Credits

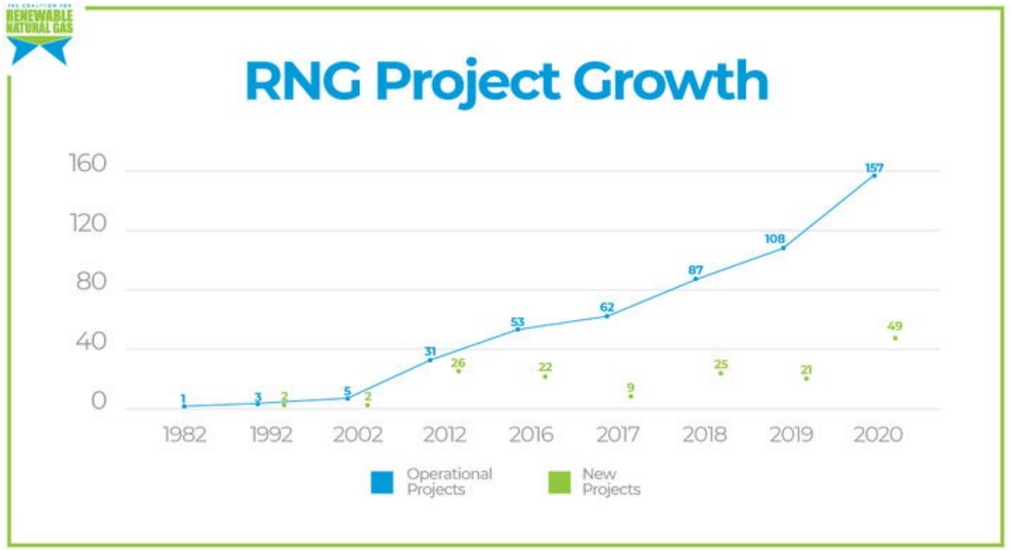
- In 2022, Puro.Earth opened all biochar sources to carbon credit application, and the ability to pre-sell biochar carbon credits (Pre-CORCs) to finance projects!
- Microsoft and Shopify spent $10 million+ on CORCs in 2021, and Nasdaq recently acquired Puro.Earth
- **Estimated 0.8 CORCs per tonne biochar, Pre-CORCs are currently listed for €40-200 EUROs on Puro.Earth**

ENERGY APPLICATION – RNG

Renewable Natural Gas (RNG)

RNG from Pyrolysis

- Pyrolysis is a second-generation technology that can convert woody material into RNG
- In Canada, utilities are offering $20-30/GJ for RNG
- In the USA, 157 operational projects in 2020 produced over 59 million MMBtu, the equivalent of over 459 million gallons of diesel



Jurisdiction	RNG Target	Utility
California	20% by 2030	SoCalGas
Vermont	20% by 2030	Vermont Gas
British Columbia	15% by 2030	FortisBC
Québec	10% by 2025	Énergir

ENERGY APPLICATION - GREEN HYDROGEN

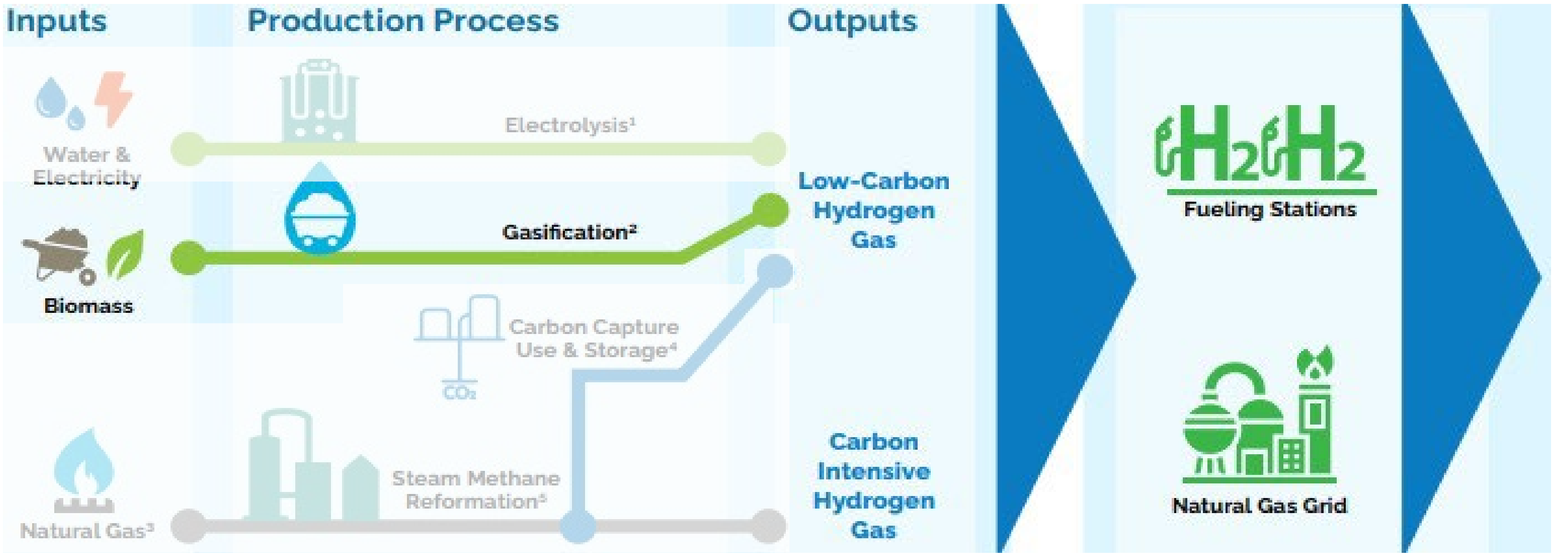
Across North America, **CHAR is well positioned for the growing demand for hydrogen energy** and is a leader in distributed green hydrogen generated from biomass including anaerobic digestate and biosolids.

✓ Canada has a $1.5B Low-carbon and Zero-Emissions Fuels Fund to increase hydrogen production.

✓ Demand for hydrogen in the US could reach 41 million mt/year by 2050. (National Renewable Energy Laboratory report)

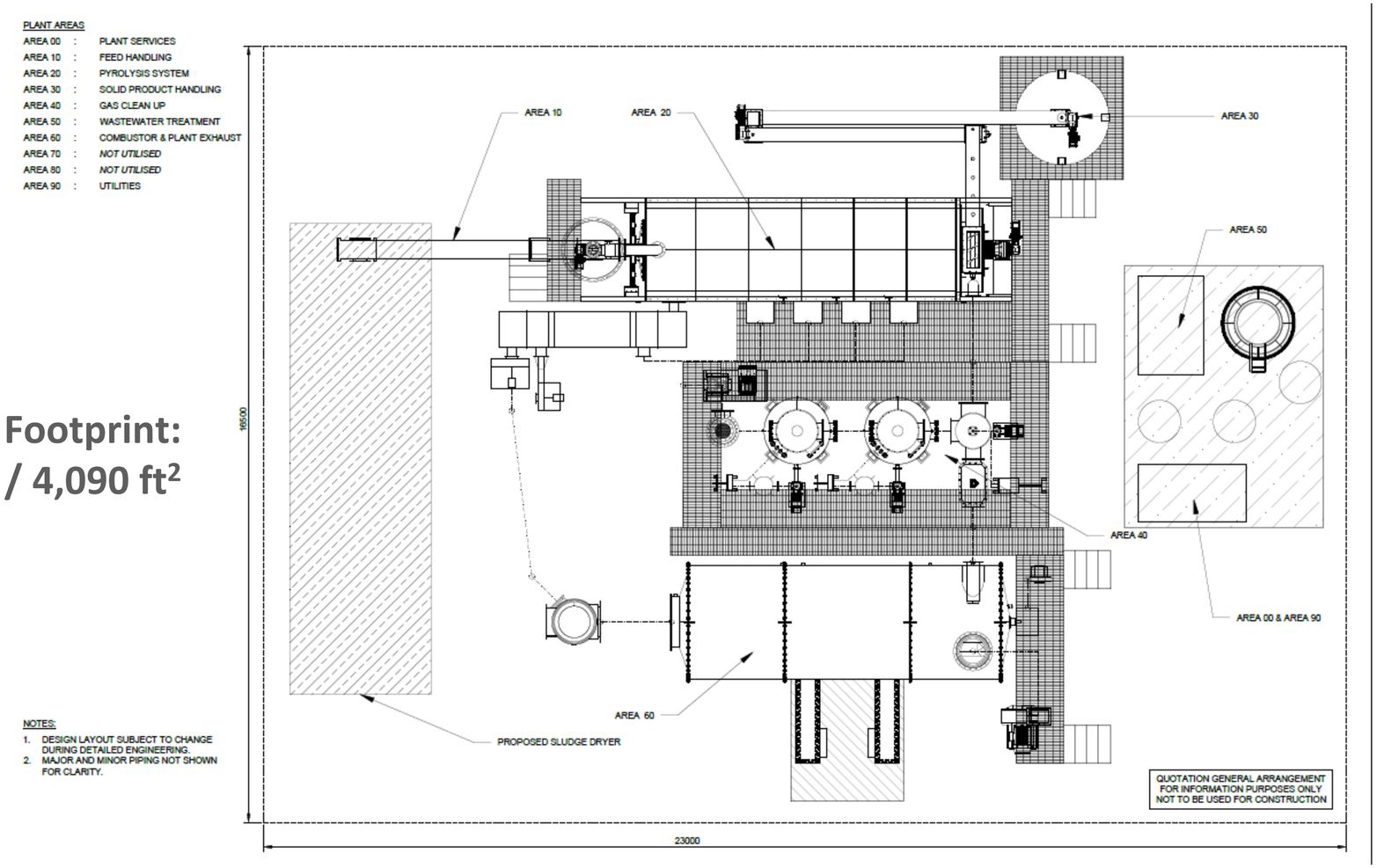
Our first facility in California will generate 50 kg/hr of green hydrogen.

H_2 Opportunity	2030	2050
% of Delivered Energy	6%	30%
Hydrogen Demand	4 Mt-H_2	20 Mt-H_2
GHG Emissions Abated	up to 45 Mt-CO_2e	up to 190 Mt-CO_2e



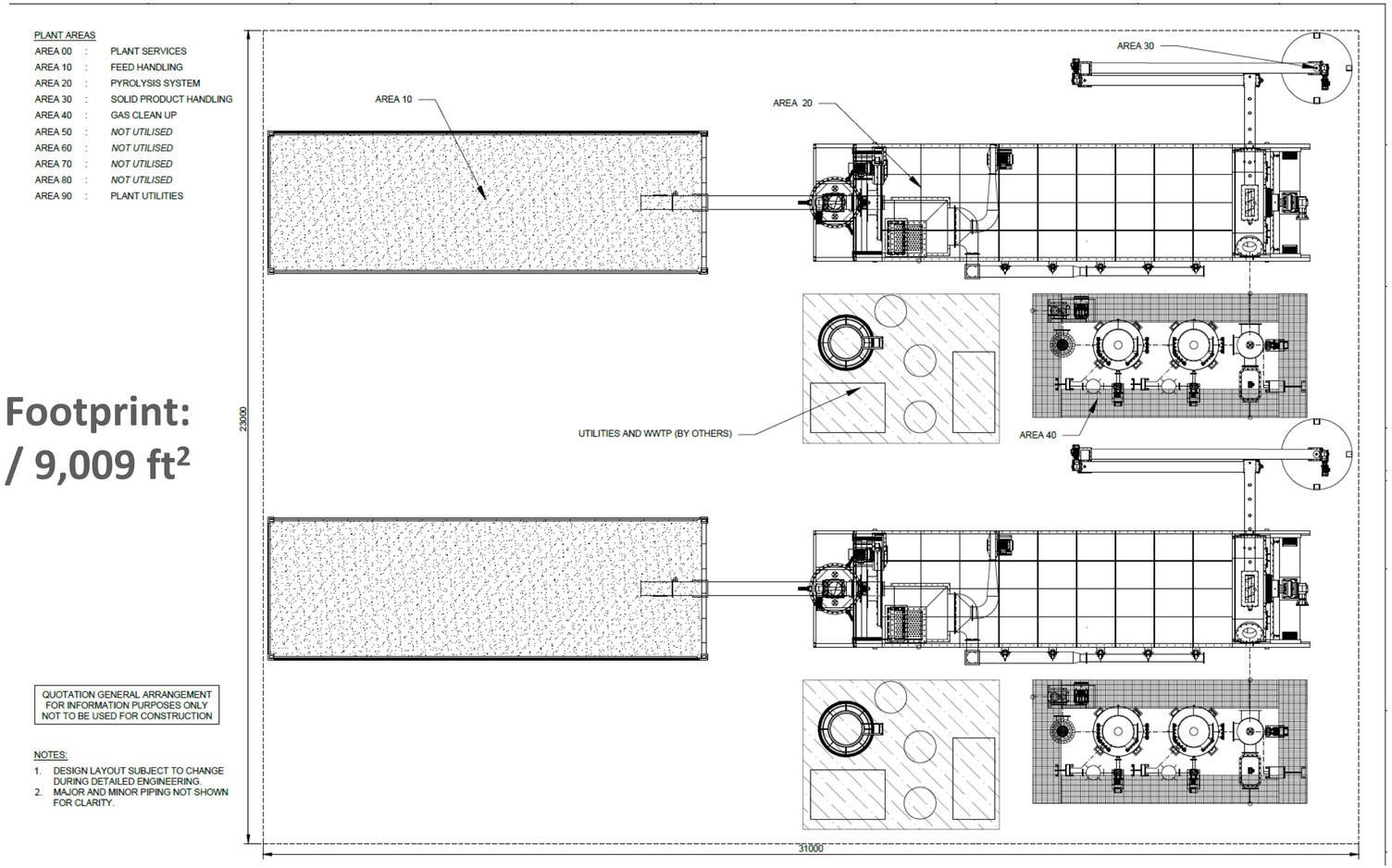
SYSTEM TOP VIEW: 20,000 TPY OF SLUDGE, 35% TS

Total Footprint:
380 m^2 / 4,090 ft^2

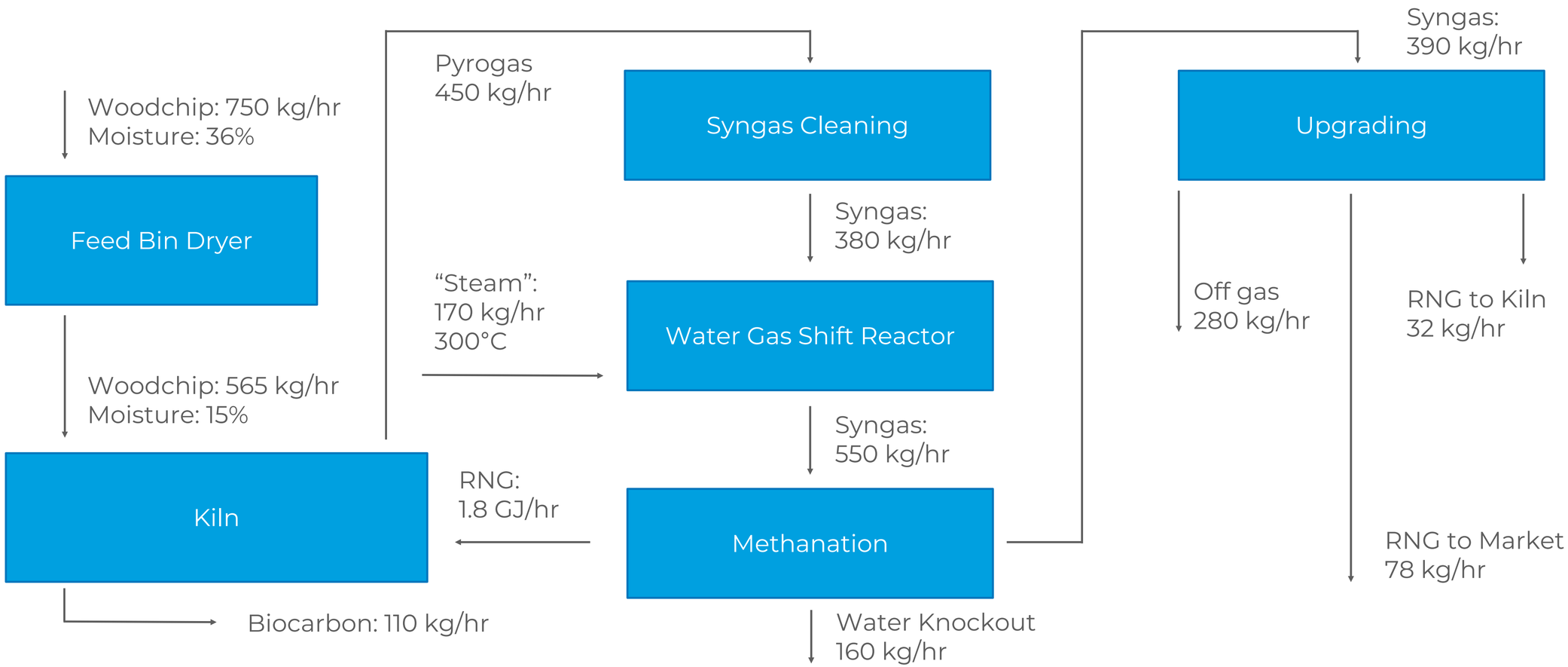


SYSTEM TOP VIEW: 60,000 TPY OF WOOD, 90-100% TS

Total Footprint:
837 m^2 / 9,009 ft^2



WOOD WASTE TO RNG HTP PROCESS FLOW



WOOD WASTE: HTP MASS BALANCE & GAS QUALITY

	Input Wood waste	Output 1: RNG	Output 2: Biocarbon
Flow (kg/hr)	750	78 (4.3 GJ/hr)	110

%v/v	Pyrogas	Syngas post Scrub.	Syngas post WGS	Syngas post Meth.	Off gas to Stack	RNG Stream
Flow (kg/hr)	450	380	550	550	280	110
CH_4	-	8%	4%	30%	-	98%
H_2	30%	35%	58%	1%	3%	-
CO	27%	32%	9%	<1%	-	-
CO_2	13%	16%	27%	28%	95%	-
H_2O	15%	2%	2%	40%	2%	-
Other HC	15%	7%	<1%	<1%	-	2%

WOOD WASTE HTP – MASS BALANCE

Parameter	HP870	HP1300	HP2100
Quantity (TPY)	4,000	14,500	30,000
Moisture Content	15%	15%	15%
Biocarbon Production (TPY)	625	2,267	4,690
Quantity Reduction	84%	84%	84%
Carbon Credits Available (CORC/Yr)	1,786	6,473	13,392
Net Available Syngas (GJ/Yr)	35,540	109,306	228,705
Electricity Available (MWh/Yr)	12,181	44,156	91,357
Hydrogen Available (Kg/Yr)	68,414	210,412	440,250
Net RNG Available with Catalytic Conversion (GJ/Yr)	18,462	56,782	118,807

WOOD WASTE HTP – SYNGAS BUSINESS CASE

CHARTECH SOLUTIONS

Parameter	4K TPY	14.5 TPY	30K TPY
Yearly Syngas Value	$177,700	$546,532	$1,143,524
Yearly Biocarbon Sale	$125,056	$453,328	$937,920
Yearly Carbon Credit Sale	$214,273	$776,739	$1,607,046
Feedstock Cost	-$120,000	-$435,000	-$900,000
Estimated Non-Labour OPEX	-$200,000	-$300,000	-$400,000
Gross Revenue	**$197,029**	**$1,041,599**	**$2,388,489**
Estimated CAPEX (CAD)	**$4,000,000**	**$7,000,000**	**$10,000,000**

Assumptions:

1. *Syngas Value: $5/GJ*
2. *Biocarbon Sale: $200/tonne*
3. *Carbon Credit Value: $120/CORC*
4. *Feedstock Cost: $30/tonne*

WOOD WASTE HTP – RNG BUSINESS CASE

CHARTECH SOLUTIONS

Parameter	4K TPY	14.5 TPY	30K TPY
Yearly Syngas Value	$612,435	$1,883,597	$3,941,099
Yearly Biocarbon Sale	$125,056	$453,328	$937,920
Yearly Carbon Credit Sale	$214,273	$776,739	$1,607,046
Feedstock Cost	-$120,000	-$435,000	-$900,000
Estimated Non-Labour OPEX	-$400,000	-$500,000	-$600,000
Gross Revenue	**$431,764**	**$2,178,664**	**$4,986,065**
Estimated CAPEX (CAD)	**$10,000,000**	**$15,000,000**	**$25,000,000**

Assumptions:

1. *RNG Value: $35/GJ*
2. *Biocarbon Sale: $200/tonne*
3. *Carbon Credit Value: $120/CORC*
4. *Feedstock Cost: $30/tonne*

WOOD WASTE HTP TO RNG – GHG & CI SCORE

Case	Anticipated CI* (gCO_{2e}/MJ)	Anticipated GHG Reductions** (Total tonneCO_{2e}/year)	Equivalent GHG production from cars
1: Waste Wood to RNG and CleanFyre	-58	-40 000	7800 cars[1] per year
2: Waste Wood to RNG and Biochar	4	-20 000	3800 cars per year

**Production* of renewable natural gas (RNG) only, not use thereof.
The boundary conditions are set surrounding the pyrolysis kiln only.
**Includes the use of RNG to displace fossil natural gas
[1]https://afdc.energy.gov/vehicles/electric_emissions.html

Dairy Digestate

- EcoEngineers completed a study which evaluated the carbon intensity (CI) impact of CharTech Solutions High Temperature Pyrolysis (HTP) technology when used to treat the digestate effluent from anaerobic digesters producing Renewable Natural Gas (RNG).

- The study concluded that HTP shows a significant enhancement of the CI score, with a range from 19 to 35 grams of CO2, eq per Megajoule for the reference case of a dairy.
- "At an LCFS Credit Price of $200/MT CO2, this represents an additional LCFS credit revenue of $4 -$7.50 per MMBTU of RNG"
  - Dr. Zhichao Wang, Senior Engineer and Carbon Analyst for Eco Engineers.

- A 12,000 head dairy producing RNG and using CHAR's HTP System to convert digestate into valuable outputs could:
  - Generate over $50M in additional revenue
  - Realize a short 2-year payback period on Capex for the HTP system

**The actual CI Score impact of CHAR's HTP System will be determined on a per project basis.*

DAIRY DIGESTATE HTP – MASS BALANCE

Based on recently conducted pilot-scale pyrolysis tests:

Parameter	HP870	HP1300	HP2100
Quantity (TPY)	7,165	22,046	44,092
Moisture Content	40%	40%	40%
Biocarbon Production (TPY)	2,198	6,764	13,529
Quantity Reduction	69%	69%	69%
Carbon Credits Available (CORC/Yr)	731	2,249	4,497
Net Available Syngas (MMBtu/Yr)	-25,653	-10,242	15,719

DAIRY DIGESTATE HTP –SYNGAS BUSINESS CASE

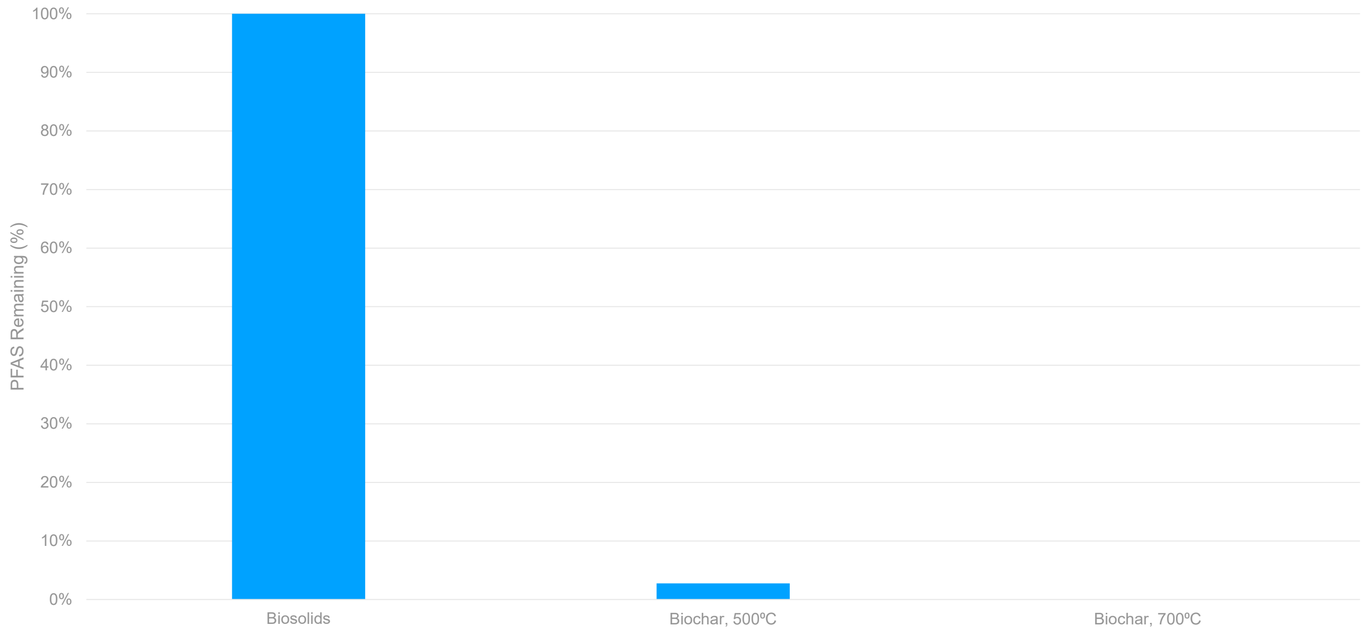
Parameter	7K TPY	22K TPY	44K TPY
Nat Gas Offset Savings ($)	-$135,222	-$53,987	$82,860
Biocarbon Sale	$199,210	$612,953	$1,225,907
Carbon Credit Value	$73,077	$224,852	$449,704
Transportation/Management Fee Avoidance	$104,035	$320,107	$640,214
Estimated Non-Labour OPEX	-$200,000	-$300,000	-$400,000
Net Revenue	**$41,100**	**$803,926**	**$1,998,686**
Estimated CAPEX (USD)	**$6,000,000**	**$8,000,000**	**$11,000,000**

Assumptions:

1. *Natural Gas Price: $5/MMBTU*
2. *Biocarbon Sale: $100/ton*
3. *Carbon Credit Value: $100/CORC*
4. *Transportation/Management Fee: $20/ton*

BIOSOLIDS – HTP PFAS REMOVAL

Presented in Aggregate of 28 Recognized PFAS Contaminants:



At 500ºC, what's still present?
- PFHxA (concentration decrease)
- PFOA (concentration **increase**)
- PFHxS (concentration **increase**)

*remember mass yields

At 700ºC, all 28 recognized PFAS contaminants are eliminated from the solid fraction.

BIOSOLIDS HTP – MASS BALANCE

Based on recently conducted pilot-scale pyrolysis tests:

Parameter	HP870	HP1300	HP2100
Quantity (TPY)	4,409	15,432	30,865
Moisture Content	10%	10%	10%
Biocarbon Production (TPY)	1,617	5,659	11,319
Quantity Reduction	63%	63%	63%
Carbon Credits Available (CORC/Yr)	892	3,122	6,243
Net Available Syngas (MMBtu/Yr)	23,967	85,583	173,429

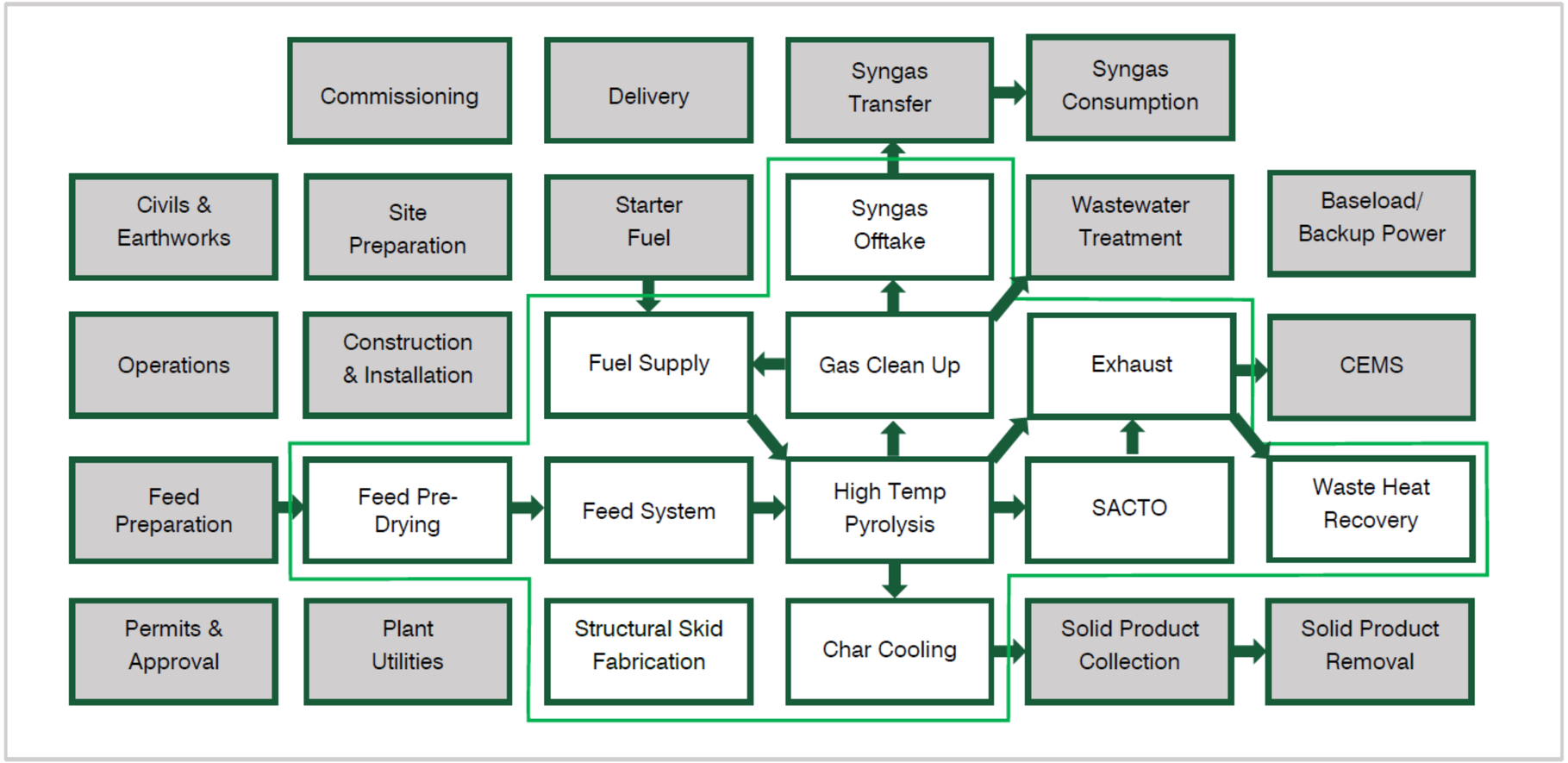
BIOSOLIDS HTP – SYNGAS BUSINESS CASE

Parameter	5.8K TPY	17.6K TPY	35.2K TPY
Nat Gas Offset Savings ($)	$126,336	$451,127	$914,188
Biocarbon Sale	$109,944	$384,804	$769,608
Carbon Credit Value	$89,189	$312,161	$624,321
Transportation/Management Fee Avoidance	$119,967	$419,884	$839,768
Estimated Non-Labour OPEX	-$200,000	-$300,000	-$400,000
Net Revenue	**$245,436**	**$1,267,975**	**$2,747,885**
Estimated CAPEX (USD)	**$4,000,000**	**$6,000,000**	**$8,000,000**

Assumptions:

1. *Natural Gas Price: $5/MMBTU*
2. *Biocarbon Sale: $75/ton*
3. *Carbon Credit Value: $100/CORC*
4. *Transportation/Management Fee: $30/ton*

CHARTECH HTP - SYSTEM SCOPE



CHAR HTP PROJECT BENEFITS

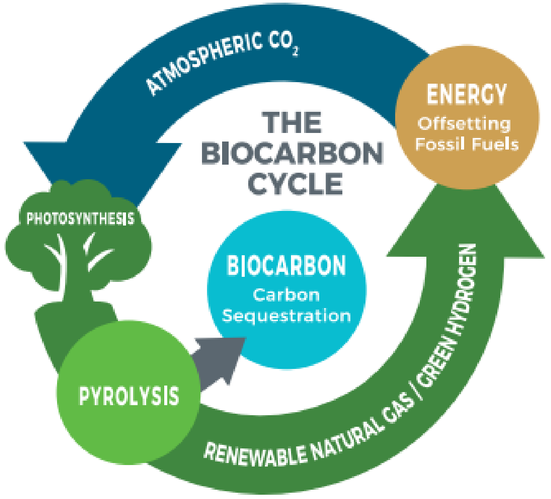
1. **Greenhouse Gas (GHG) Emission Reduction:** 10 year average impact = 607,770 t-$CO_{2,eq}$

2. **Job Creation:**
   - Permanent: Two (2) management + Six (6) Operations staff = 8 new jobs
   - Ongoing Indirect: Contracts for local skilled trades (maintenance & support)

3. **Recreational:** Odours are eliminated at high temperature, quiet operation

4. **Socioeconomic:** Compact, scalable system allows for minimal impacts on surroundings

5. **Compliance:** Environmental Compliance Approval (ECA) issued by the Ontario Ministry of the Environment



CHAR HTP BUSINESS MODEL OPTIONS

Capital Purchase: The HTP System is purchased outright by the client.

Lease/Lease-to-Own: The HTP System capex value is distributed as a monthly/quarterly lease to the client, with the ability to add a buyout option after 5-10 years.

JV/SPV: CHAR & the client establish a joint venture (JV) / special purpose vehicle (SPV), where both parties provide equal investment in the project. Typically, the partner provides a site, feedstock, while CHAR provides the HTP system and biocarbon offtake. Revenues from the project outputs (both biocarbon and gas) are shared over an established time period.

BOOT - Build-Own-Operate-Transfer: CHAR moves the project forward as the initial project owner by financing the cost of the HTP system, with the client providing system operations and the site/infrastructure. While CHAR owns the assets, CHAR receives revenues directly for the project outputs (energy and biocarbon). Upon executing the transfer, at their option, the partner purchases the equipment. Ongoing project output revenues are dispersed based on a predefined agreement.

Long-Term Offtake: Applying only for woody biomass feedstocks, CHAR can provide a long-term offtake agreement for wood residuals at a set value to generate biocarbons and renewable natural gas.

CHARTECH SOLUTIONS

CHAR technologies

CHAR BIOCARBON

INNOVATIVE SOLUTIONS THAT CONTRIBUTE TO THE CIRCULAR ECONOMY

CharTech Solutions develops and delivers innovative environmental technology solutions to eliminate air and water pollution and convert challenging waste streams into renewable and valuable outputs, helping our clients contribute to the circular economy.

WHY WORK WITH CHAR?

CHAR is a cleantech company that provides innovative environmental solutions to eliminate liquid and solid organics pollution - contributing to the circular economy.

- ✓ **Innovative HTP Technology** converts organic feedstocks into renewable gases, heat, and biocarbons (biochar)
- ✓ **Patented Biocarbon Outputs**, in addition to traditional biochar fertilizer, CHAR developed a zero-waste adsorption media supplement SulfaCHAR™ and breakthrough biocoal CleanFyre™
- ✓ **Reduce Carbon and Waste –** Reduce waste mass by up to 90%, eliminate transportation, and generate carbon offsetting biocarbon / renewable energy to decarbonize operations

Andrew Friedenthal
Business Development Manager

CHAR Technologies Ltd (TSXV: YES)
403 - 789 Don Mills Rd., Toronto, ON,
Canada M3C 1T5
T: 647.926.6144
afriedenthal@CHARTechnologies.com
www.CharTechSolutions.com