Renewable
Clean Energy

CZC ™

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Charbon Zero Corp™ (CZC™)

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Renewable Clean Energy from Non-Recyclable Wastes using Fluidized Bed Combustion with Full Carbon Capture and Utilization

The Case for Decarbonization

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Charbon Zero Corp™ (CZC™)

Mission Statement:

Charbon Zero Corp™ (CZC™) was formed to Generate Renewable Clean Energy[1] from Non-Recyclable Waste Plastic, Plant-Derived Wastes and Specialty Wastes using Fluidized Bed Combustion (FBC)[2] with Full Carbon Capture and Utilization (FCCU):[3]

- A Substantial Business Opportunity
- Generates Valuable Residual Products
- Reduces or Eliminates Non-Recyclable Wastes
- A Clean Technology Intended to Mitigate Climate Crisis[4]
- A Critical Unmet Human and Environmental Health Need
- An Autonomous Energy Resource to assure Grid Resilience
- A Sustainable[5] Approach to Repurposing Growing Waste Streams

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[1] **Renewable Clean Energy**: Energy Generated from Replenishable Resources, including Solar, Wind, Hydroelectric, Geothermal, Oceanic, Hydrogen, Biomass or Human-Originated Wastes, that will not release Contaminants or Pollutants to the Environment

[2] **Fluidized Bed Combustion (FBC)**: Thermolytic Decomposition of solid waste by suspension in hot ash and particulates, with jets of oxygen-rich air to promote rapid heat transfer amid extreme physical and chemical reactions

[3] **Full Carbon Capture and Utilization (FCCU)**: Prevents Carbon Dioxide (CO_2) release to the atmosphere by a proprietary *Carbonization* [6] Technology that Captures CO_2 from exhaust gas for conversion to additional Clean Heat Energy

[4] **Climate Crisis**: Global Warming, Climate Change and their consequences

[5] **Sustainability**: Capacity for Earth's biosphere and human civilization to co-exist by conserving balance that avoids depletion of natural resources

[6] **Carbonization (i.e., Decarbonization or Carbon Mineralization)**: Production of a pure carbonaceous product (e.g., Carbon, Hydrochar or Biochar) by hydrolytic or thermolytic depolymerization or decomposition of organic materials with removal of non-carbon chemicals and the coincident production of a fixed carbon mass with a porous structure

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Objectives

- Develop and Operate an initial FBC Facility employing Full CCU as a Sustainable New Business Enterprise, with intent to Develop Additional Facilities to provide Clean Energy[1] to Underserved Markets
- Provide Autonomous Energy Resources from Non-Fossil Fuel-Based Waste Streams to assure Grid Resilience in the event of Unanticipated Grid Failure, Infrastructure Crisis or Natural Disaster
- Eliminate Pollution from Non-Recyclable Waste Plastic,[2] Plant-Derived Waste and Specialty Waste
- Target Point-Source,[3] GreenHouse Gas Pollution to assure sensitivity to Climate Crisis
- Protect Human and Environmental Health

[1] *"One Watt of Clean Energy has Greater Inherent Value than One Megawatt of Fossil Fuel-Derived Energy"* (Watt [W] = Unit of Power; One Megawatt [MW] = 1,000,000 Watts)

[2] Plastic Pollution of Puget Sound and its adjacent lands, surface and ground waters by non-recyclable waste plastics represents a primary threat to Salmon, Orcas, People and other living things of the region, as well as to the Sound itself, including the entire Salish Sea

[3] Containing Pollution from Point-Sources, as opposed to focusing on i) Eliminating Plastic Production or ii) Direct Air Capture from the Atmosphere. The US EPA defines Point Source Pollution as any single identifiable source of pollution from which pollutants are discharged, such as a pipe, ditch, ship or smokestack. Factories, Refineries and Sewage Treatment Plants are the most common sources of Point Sources of Pollution.

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Philosophy

- Establishing Autonomous Energy Resources from Non-Fossil Fuel-Based Waste Streams to assure Grid Resilience is a matter of National Security
- Respect for Salmon, Orcas, People and other living things of the region, including all of Puget Sound and the entire Salish Sea, is Vital
- *Full Carbon Capture and Utilization* (FCCU) is Essential
- Human and Environmental Health are the Focus
- Climate Crisis Merits and Holds our Attention
- Targeting Point-Source Pollution is Critical
- Clean Energy from Waste is Sustainable

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Founders, Directors and Executive Management:

The Founders of Charbon Zero Corp (*CZC™*) are entrepreneurs who have worked in the fields of environmental science, soil science, microbiology, infectious diseases and cancer for decades. They have now combined their collective experience into one consolidated effort to offer a beneficial approach to the development and operation of advanced Fluidized Bed Combustion Facilities to Generate Clean Energy from Non-Recyclable Waste Plastic, Plant-Derived Waste and Specialty Waste, with Full Carbon Capture and Utilization.

Richard C. Honour, PhD, Chairman, President & CEO:

Dr. Honour served as Founder, President & CEO of several biotechnology firms focused on new treatments for infectious diseases and cancer. He served as an Executive and Board Member of several biotechnology firms. He holds a Doctorate from the University of California, with a specialty in soil science and microbiology. He specializes in the identification and evaluation of toxic wastes and specific remedies for environmental contaminants and pollutants.

Chris V. Rathe, BS, Director, VP Business Development & CFO:

Chris Rathe is an Entrepreneur and Founder of several biotechnology and software firms, with specific responsibilities for business and strategic planning, financial operations, corporate and intellectual property law, licensing and administration of operations. His fields of endeavor have included commercial real estate and technology company business development. He holds a BS in Business Administration and Finance Law from Portland State University.

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Anticipated Beneficial Outcomes:

- Supplement Fossil Fuel-Based Energy with Renewable Clean Energy
- Provide Renewable Clean Energy-Based Economic Development[1]
- Provide Alternative Destinations for Non-Recyclable Combustible Wastes Destined for Landfill, Incineration, Water Disposal or Discard
- Supplement Solar, Wind, Hydroelectric, Geothermal, Hydrogen, Oceanic, Biomass and other Renewable Clean Energy Resources[2]

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[1] **Economic Development Attributes**:

- Enhanced Community Benefits:
  - ✓ Education[3]
  - ✓ Public Health[3]
  - ✓ Quality of Life[3]
  - ✓ Employment
  - ✓ Environmental Health
  - ✓ Community Development

[2] **Note:** Generation of Renewable Clean Energy from Non-Recyclable Waste Plastic, Plant-Derived Waste and Specialty Waste, using Fluidized Bed Combustion with Full Carbon Capture and Utilization, Reduces or Eliminates the Accumulation or Diversion of Polluting Wastes, while Solar, Wind, Hydroelectric, Geothermal, Hydrogen and Oceanic Renewable Clean Energy Sources do not

[3] **Note:** Education, Public Health and Quality of Life represent the three cardinal qualities of society upon which we are dependent and reliant for maintaining intact societal structures, such as and including our governmental organizations, as key elements of our safety and security

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Technology & Engineering Attributes:

- Generation of Renewable Clean Energy from Non-Recyclable Wastes, plus Valuable Carbon and Ash byproducts
- Elimination of Toxic Byproducts*
- Elimination of Wastes

* Elimination from the environment of Toxic Byproducts, which may include Volatile Organic Compounds (VOCs), such as and including Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxides (N_2O and other NOx), Hydrofluorocarbon-23 (HFC-23/ CHF_3), Perfluorocarbons (PFCs), Sulphur HexaFluoride (SF_6), Chlorofluorocarbon-12 (CFC-12/CCl_2F_2), Nitrogen Triflouride (NF_3), plus toxic metals and organic and inorganic chemicals, including Dioxins, Furans, PAHs, PBDEs, PCBs and PFAS/PFOS, the combinations and permutations of which remain wholly unknown, as are their cumulative, additive, direct or synergistic toxicities

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Combustion vs Incineration

Combustion and Incineration are high-temperature exothermic redox chemical reactions between Reductants (Fuels/Feedstocks) and an Oxidant (Atmospheric Oxygen) to Produce Heat for Energy, Oxidized Gaseous Products (Flue Gas/Exhaust) and Ash

Objectives:

- Incineration - Reduce Fuel/Feedstock Mass and Volume, and Toxics
- Combustion - Generate Renewable Clean Energy and Eliminate Toxics*

*Note: Fluidized Bed Combustion (Thermolytic Decomposition) is employed to burn solid fuels, whereby fuel particles are suspended in a hot fluidized bed of ash and other particulate materials, through which jets of air are blown to provide oxygen for combustion or gasification

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Combustion vs Incineration

Fluidized Bed Combustion (Thermolytic Decomposition) with Full Carbon Capture and Utilization Intends to:

- Eliminate Wastes
- Eliminate Toxic Byproducts
- Generate Renewable Clean Energy

Incineration Intends to:

- Reduce Waste Mass and Volume
- Reduce Toxic Byproducts

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Feedstock Resources:

Non-Recyclable Waste Plastic[1], Plant-Derived Waste[2] and Specialty Waste,[3] including organic combustibles, such as:

[1] Non-Recyclable Waste Plastic: Waste Plastic destined for landfill, water disposal or incineration, but not for recycle, reuse or repurposing

[2] Plant-Derived Waste: Organic wastes from forests, foods or agriculture, including non-recyclable paper, cardboard, wood products, food processing wastes, animal feeds and human foods

[3] Specialty Waste: CAFO Manures, Septage, Wastewater Treatment Plant Sewage Sludge, Security Wastes and Organic Industrial Wastes

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Financing Objective:

- CZC™ is focused on feedstock procurement, corporate partnering, site selection, permitting, technology, engineering, market research and energy sales
- The intent is to position CZC™ for a financing to support the development and operation of an initial facility in Washington State to produce Clean Energy from Non-Recyclable Waste Plastic, Plant-Derived Waste and Specialty Waste

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The World Faces a Waste Plastic Pollution Crisis:

- During the past 60 years, 8.3 billion tons of plastic have been produced, with just 9% recycled
- More than 99% of plastics are created from fossil fuels, including from fracked gas
- The US produced more than 320 million tons of plastic to date, which will double by 2034
- The US is the second largest global consumer of plastic, generating nearly 50 million tons of Waste Plastic per year, yielding more Waste Plastic than any other country
- The fate of Waste Plastic is primarily to landfill, incineration or water disposal, with less than 10% sent to recycling or other repurposing
- More than $260 Billion is being invested in new natural gas operations globally to convert ethane from natural gas to ethylene, then by polymerization to polyethylene, the primary plastic feedstock, to make 40% more plastic

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Waste Plastic Facts of Life:

- Waste Plastic-to-Energy facilities may generate 39,000 new jobs and $10 billion in economic output
- If present trends continue, by 2050 there will be 12 Billion metric tons of plastic in landfills
- The US generates more than 35 million tons of plastic/year, but recycles just 8.3%
- Making new plastic from oil is cheaper and easier than making it from waste plastic
- Big Oil generates more than $400 billion/year producing plastic
- Plastic production is expected to triple by 2050
- Plastic takes 500-1000 years to degrade

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World Waste Facts

Globally (2021) (World Waste Facts (theworldcounts.com)):

- 1,258,093,202 Tons of Solid Waste - Disposed on Land
- 7,536,667 Tons of Plastic Waste - Disposed in Oceans

The CharbonZero (CZC) Connection

What is the Carbon Footprint[1] of a Truck?

(What is the carbon footprint of a truck? - FreightWaves)

- Transportation[2] is responsible for 34% of all CO_2 emissions
- CO_2 from combustion of fossil fuels (coal, natural gas, oil) makes up about 81% of GreenHouse Gases (GHGs)

[1]**Carbon Footprint:** Total GreenHouse Gases (GHGs) a person or entity creates through daily activities (Includes CO_2, CH_4, NOx & HFCs [EPA])

[2]**Transportation:** Includes truck and passenger vehicles, air, marine and rail

Note: A CZC facility will process about 100,000 tons of Mixed Waste Feedstock per year, shipped primarily by truck, which may generate about 2,000 tons of CO_2 per year, eliminating about 98,000 tons of CO_2 per year, a 2% "Reduction Benefit"

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Incineration, Repurposing, Recycling, Upcycling, Downcycling or Conversion of Waste Plastics to BioFuels, Conventional Fuels, Lubricants, Chemical Feedstocks or Biochar, results in the release of GreenHouse Gases (e.g., CO_2), that Contribute to Climate Crisis

GreenHouse Gases by the UNFCCC/Kyoto Protocol:

- Carbon Dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O, plus other NOx)*
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Nitrogen Triflouride (NF_3)
- Sulphur HexaFluoride (SF_6)

*NOx is a generic term for Nitrogen Oxides that are most relevant to air pollution, i.e., Nitric Oxide (NO) and Nitrogen Dioxide (NO_2)

GreenHouse Gases:	Global Warming Potential:
Carbon Dioxide (CO_2)	1
Methane (CH_4)	25
Nitrous Oxide (N_2O)	265
Chlorofluorocarbon-12 (CFC-12/CCl_2F_2)	10,200
Hydrofluorocarbon-23 (HFC-23/ CHF_3)	12,400
Nitrogen Trifluoride (NF_3)	16,100
Sulfur Hexafluoride (SF_6)	23,500

(www.esrl.noaa.gov/gmd/ccgg/trends)
Main Greenhouse Gases | Center for Climate and Energy Solutions (c2es.org)

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A Functional Solution:

(***Prevent, Not Fix***)

Targeting Point-Source Pollution

Fluidized Bed Combustion of Non-Recyclable Waste Plastic, Plant-Derived Waste and Specialty Waste to Produce Clean Energy with Full Carbon Capture and Utilization will assure a growing market for new plastic feedstocks and products, while curbing the challenges of global pollution and the associated adverse consequences to human and environmental health

The Quality of our Primary Product (Clean Energy) will be a Direct Function of the Quality and Effectiveness of our Technology and Engineering, plus the Quality Characteristics of the Feedstocks

Complete Thermolytic Decomposition and Full Carbon Capture are Essential

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Fluidized Bed Combustion:

- Provides Public Health-Driven, Environmental Health-Driven and Positive Economic Alternatives to the detrimental processes of waste plastic recycling, repurposing, upcycling, downcycling, incineration, land-filling or water disposal
- Non-Recyclable Waste Plastic, Plant-Derived Waste and Specialty Waste can be repurposed beneficially by Fluidized Bed Combustion with Full Carbon Capture and Utilization to generate efficient Heat for Clean Energy as an alternative to fossil fuel combustion, and to complement clean Solar, Wind, Hydroelectric, Geothermal, Hydrogen, Oceanic, Biomass and other Renewable Clean Energy Resources

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Incineration vs Fluidized Bed Combustion of Plastic

- **Carbon Footprint by Incineration:**
  - ✓ 1 Kg of Waste Plastic yields about 6 Kg of CO_2 (GHG+)
  - ✓ 1 Plastic Bag ≈ 5.5 Grams, yields ≈ 33 Grams of CO_2 (GHG+)
- **Carbon Footprint by Fluidized Bed Combustion:**
  - ✓ Negligible Release of CO_2 (*Within Compliance Guidelines*; GHG-)

Carbon Footprint of Plastic | Stop Plastics

Fluidized Bed Combustion Is Not Incineration

- **Fluidized Bed Combustion (FBC):** Thermal Decomposition of Waste by suspension in hot ash and particulates, with jets of oxygen-rich air to promote rapid heat transfer amid extreme physical and chemical reactions, to achieve:
  - ✓ Maximum Generation of Renewable Clean Energy
  - ✓ Minimal Loss of Carbon to the Environment as CO_2
- **Incineration:** High-Temperature Combustion of Waste to achieve:
  - ✓ Volume Reduction
  - ✓ Energy Recovery

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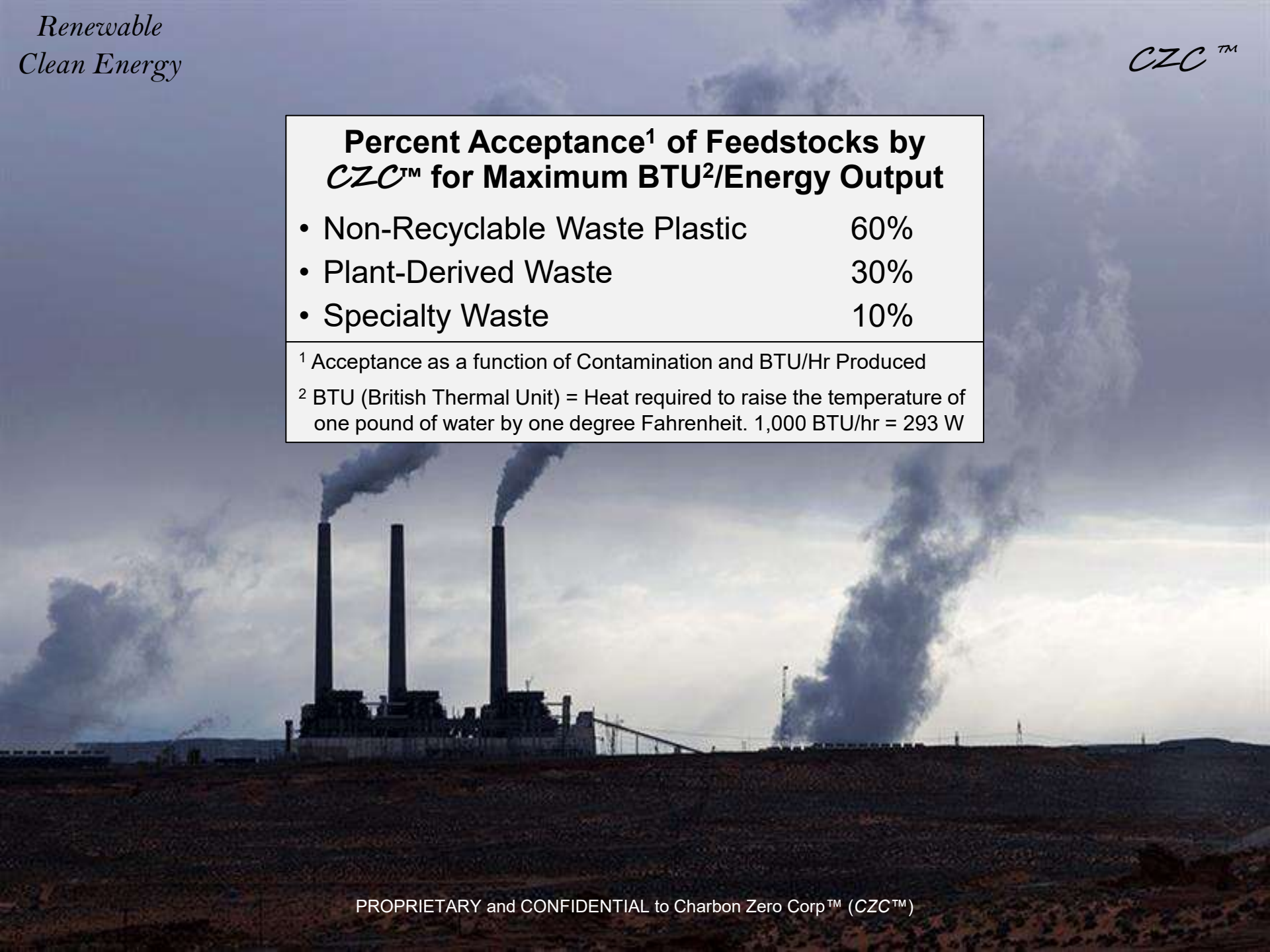

Percent Acceptance[1] of Feedstocks by CZC™ for Maximum BTU[2]/Energy Output

• Non-Recyclable Waste Plastic	60%
• Plant-Derived Waste	30%
• Specialty Waste	10%

[1] Acceptance as a function of Contamination and BTU/Hr Produced

[2] BTU (British Thermal Unit) = Heat required to raise the temperature of one pound of water by one degree Fahrenheit. 1,000 BTU/hr = 293 W

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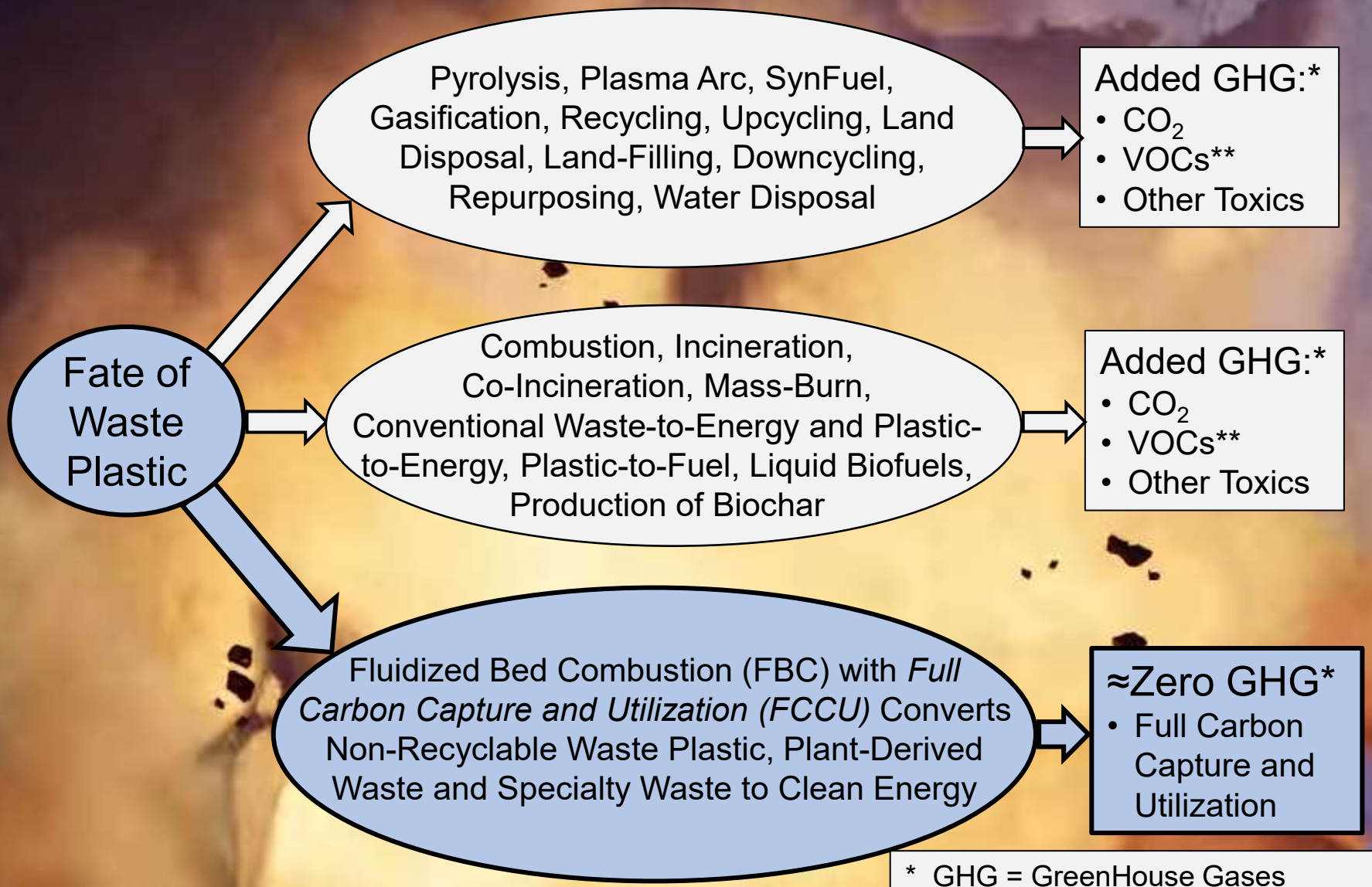

* GHG = GreenHouse Gases
** VOC = Volatile Organic Compounds

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