

Snapshot

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Overview:

- Reduces operating/production costs of wood-pellet manufacturing, electrical generation and liquid biofuel production
- Carbon Capture, Utilization & Sequestration (CCUS) system capable of 50% + reduction & capture of aggregate inherent CO₂ & CO₂-e compounds contained in all forms of Biomass
- Ability to produce a “torrefied-spec” chip or pellet from lower-quality feedstock – increased Sustainability practice
- Scalable, modular units ranging from 30 tons per hour to 250 tons per hour (250k tons/yr. to 1 MM tons/yr.) installed between feedstock and dryer at operating plants
- Higher bulk and energy density increasing global commodity value
- Comprehensive study co-sponsored by \$12 BN market cap public utility and Electric Power Research Institute (“EPRI”)

Emissions Reduction Benefits:

- SO_x Emissions: 30% - 80%
- NO_x Emissions: 30% - 50%
- CO₂ Emissions: 10% - 60%
- Hg Emissions: 30% - 98%
- CL Emissions: 30% - 74%
- Na₂O In Ash: 30% - 76%

Company Overview



CBA Environmental Services, Inc. (the “Company” or “CBA”) has developed the **CBA Remedial Biomass Solutions (“RBS”)** biomass optimization process. RBS is an easy to deploy, modular, pre-combustion – pre-pelletizing chemical-thermal biomass enhancement process which uses patented chemical treatment of wet, green waste wood and agro-waste to improve power plant heat rates and increase boiler efficiencies while reducing the overall cost of generation through reduced fixed and variable O&M costs of emissions control equipment.

The RBS technology produces a high-grade solid biofuel that is stable, homogenous, much higher energy density and calorific value, providing significant benefits in logistics, handling and storage. Substantial reduction in dryer costs resulting in reduced operational costs and increased boiler efficiency in power plants using biomass, or in fuel “co-firing” scenarios utilizing multiple fuels for consumption by the power generation industry.

The RBS process reduces moisture, ash, sulfur, chlorides, sodium, mercury, arsenic carbon oxides & other pollutants while increasing heat content. The upgraded product is stable and non-friable and does not reabsorb moisture (hydrophobic), resists spontaneous combustion and biological activity, and **DOES NOT** require any special handling or storage requirements. RBS is a modular process that easily installs in-line between feedstock and dryer.

Over 600 studies have been undertaken including 12 commercial pilot-scale tests and one EPRI-Public Utility co-sponsored program proving the RBS, and its co-process RCS on biomass and other carbon-intensive fuel types in North America, Europe, Australia, South America and Indonesia. CBA operates a commercial-scale pilot test unit, including the integrated CBA/SRS-MET Mine Drainage wastewater treatment technology (“SRS”), which was designed, built and commercialized for the mining and power industry by CBA. Additionally, all RBS systems include the integrated CO₂/ Carbon Oxide capture and conversion system that converts recovered carbon oxides into a commercial-grade fertilizer for application in re-forestation completing a full-circle Sustainable process.

The RCS and RBS technologies are fully compliant with USEPA, US DOJ and multiple State Environmental agencies. A \$12 BN market-cap public utility co-sponsored the comprehensive vetting of the RCS process in combination with EPRI and the University of Utah. EPRI is a global thought leader in the energy space and currently serves thousands of members globally.



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Operations & Maintenance Benefits:

- Significant increase in dryer efficiency due to proprietary chemical treatment – “slips-by” lignin resulting in no negative effect on product density
- Increase in Power Plant Boiler Efficiency: 4% - 12%
- Reduce Fuel Demand to meet Base Load power output: up to 25% = Arbitrage
- Reduce Overall Costs of Emissions Control Systems, Variable and Fixed O&M Costs: Up to 92% (varies by biomass type)

Fuel Quality and Stability Benefits:

- Ability to produce a torrefied – spec chip or pellet without torrefaction gas & tar generation
- Improve Heat Content: 30% - 50% (varies by biomass type). Ability to utilize lower-quality feedstock
- Ability to achieve Carbon Negative status due to Carbon Oxide capture, sequestration and utilization as fertilizer for Re-Forestation
- Reduce moisture content: 35% - 70% increasing dryer throughput
- Resists moisture re-absorption over long periods of time
- No special storage or handling required – No dusting

Opportunity

CBA is seeking to explore strategic partnerships with credit worthy counterparties engaged in the Biomass Industry

Process Highlights

- **Sustainability & Carbon Negative:** The RBS process is a low-temperature chemical-thermal breakthrough Biomass optimization technology that utilizes most of the process equipment installed at a biomass power or pellet manufacturing operation to substantially reduce operating cost, capture and utilize > 50% of the aggregate inherent carbon oxides in feedstock and transform the carbon oxides into a commercial fertilizer for use in re-forestation activities to create a carbon –negative status in a full-circle sustainable initiative for the industry.
- **Stability:** Spontaneous combustion (“SC”) is completely eliminated in biomass upgraded by the RBS process. The biomass is Hydrophobic, will resist moisture reabsorption and resist biological activity. Energy density is increased as a result of the combined chemical-thermal application utilizing existing dryer installation. RBS-treated chips and pellets may be exposed to the elements including moisture and air for long periods of time with no negative influence as well as require no special handling considerations or secondary concerns after treatment is complete.
- **Transportation:** Reduction of water content by 35% to 70% (based on biomass type) increases market value based on heat content (19.5-22 GJ) and saves on shipping costs for both producers and consumers of biomass.
- **Improve Overall Economics:** Improvements in boiler efficiency and increase in heat value (15 GJ to 19.5 GJ) allows for same base-load output with up to 25% less fuel required. Reduced shipping costs due to lower water content, increased MW’s available for generation and reduced load on emissions control equipment leads to reductions in variable and fixed O&M costs.
- **Commercially Viable Process:** Over 600 tests completed including 12 commercial scale pilot tests and a Power-Industry co-sponsored EPRI evaluation on a wide range of domestic and foreign biomass and carbon fuel types. Comprehensive evaluation and commercial recommendation by EPRI, and was deemed superior against competitors. Design uses readily available equipment found in the biomass and aggregate processing industries.

RBS PROCESS FLOW

