

ATP-MD, LLC's Combined Remediation Biomass and Bio-Product Production (CRBBP) Process Will Help Baltimore Cost-Effectively Fight Climate Change, Advance its Sustainability Plan, & Create New "Bio-Economy" Jobs

Presented to the Exelon Foundation By: Joseph J. James, President, ATP-MD, LLC (ATP-MD) - (803) 413-6801 - josephjjames@bellsouth.net



Problems

- Climate "Crisis": We urgently need fast-acting, intensive and cost-effective CO 2 capture, and Carbon re-use and sequestration mechanisms.
- Large Emitter Environmental Impacts: We need new and cost-effective ways to reduce the Environmental Impacts of Large CO 2 Emitters.
- Multiple Environmental Impacts: When possible, we need multi-tasking solutions to eliminate or reduce Multiple Environmental Impacts.



ATP-MD's Solution

We plant and then multi-task special **Bio-Crops** and their resulting **Biomass, to do Good Things,** for People and the Planet, **Less Expensively, including** capturing CO 2, Remediating air, soil and water, and Reusing the Captured Carbon.



Biomass Sorghum's "Superior" CO 2 Capture Capabilities



Figure 2. Relative amounts of CO₂ captured over 15-year period from 100acre plot of forage sorghum, switchgrass, and pine. Credit: Dr. Daniel Sanchez, University of California-Berkeley.



Biomass Sorghum: Grows Fast, Big & Captures 14 Tons of CO 2/Acre







Biomass Sorghum



CRBBP Process: Multi-Tasking Reduces Costs/Task

<image>

For 1 Task Cost = \$C/Task 1

- For 3 Tasks Cost = \$C/(T1+T2+T3)

For ∞ Tasks Cost = $C/(T_1...T_{\infty}) =$





CRBBP Process: Key Tasks CO 2 Capture & the Remediation Air, Soil & Water Harvest/Shred Make **Plant Bio-Crops Bio-Crops Bio-Products Re-Use/Sequester Captured Carbon: 1. Filler Powders*** 2. Poultry Bedding **Biochar*** 4. Bio-Coal* Made Using ATP's **Torrefaction Process**

Our Patented & Cost-Effective Torrefaction Process

- Our **Torrefaction Process**, **Heats** plant or wood material (**Biomass**), in a **low-oxygen** environment, which evaporates away the water and much of the organic compounds, resulting in a carbon and energy-rich, **charred material**.
- The organic gases are **Captured** and **Burned** by our **Torrefaction Units**, to cost-effectively and with minimal environmental impact, generate **all** required **Process Heat**.
- **Torrefied Biomass** can be used to make a variety of **Bio-Products: e.g. Filler Powders**, to make better-performing and recyclable **Plastics**; **Biochar**, to make poor soils more productive; and a clean and renewable **Bio-Coal**, co-fire fuel.



Our 1st CRBBP Process Demo: Protecting the Chesapeake Bay



Our CRBBP Process costeffectively removed excess Nitrogen and **Phosphorus from Chesapeake Bay** watershed farmland, to protect the Bay's aquatic life, while capturing CO 2 and also making costadvantaged Bio-Products.



Biomass Sorghum Growing in Maryland's Eastern Shore





It's More Efficient to Capture CO 2 at Large, Point-Source Emitters





Our Vertical Bio-Crop Farms (VBF's) Bring Bio-Crops Close to Large, Point-Source, CO 2 Emitters





Our VBF's: May More Than Double CO 2 Capture to 30 Tons/Acre!!!

- Our Biomass Sorghum's <u>NORMAL</u> Growing Season is for 6 months, <u>ONCE</u>, a year.
- However, VBF's, using artificial lighting and a controlled-environment, are expected to allow <u>TWO</u> Growing Seasons, a year.
- Therefore, VBF's may more than <u>DOUBLE</u> the impacts of our CRBBP Process.



CRBBP Process: Proposed Baltimore Applications & Benefits

- Capture CO 2 Emissions From Power Plants, Incinerators, Industry & the Harbor Tunnels
- Clean Up Brownfield Sites & Polluted Air in Neighborhoods
- Expand the "Bio-Economy", as we convert the Captured Carbon into "Cost-Advantaged" Bio-Products



Our CRBBP Process Can Reduce Industry's Environmental Impacts





Our CRBBP Process Can Treat Coal Ash & Brownfield Sites





Our CRBBP Process Can Capture Harbor Tunnel CO 2 Emissions





Our CRBBP Process Improves Neighborhood Air Quality





CRBBP Process: Markets for ATP-MD's Bio-Products

- **Bio-Based Filler Powders:** The \$380 billion US plastics market
- **Poultry House Bedding:** The \$48.3 billion US poultry market
- **Biochar:** The \$8 billion US garden consumables market (Potting Soil)
- **Bio-Coal:** The 9+ billion TPY, global coal market



ATP-MD's Team,

Founder:

Joe James, ATP-MD's President, is a former, 33-year economic development professional, who has been a biomass leader in the Southeast US, since 2004. He invented and patented ATP-MD's CRBBP Process, and licensed and patented a great Torrefaction Process. In December 2017, he completed a 6-year term on the federal Biomass R&D Technical Advisory Committee. Mr. James received a BS in Science, from Union College, and has studied Law and Business Administration at New York University.

Collaborators & Contractors:

Industry: Electric Power Research Inst. (EPRI), Farmers, Bio-Crop Seed Companies, Biomass Leaching Companies, Manufacturers, Etc.

US Government: EPA, MBDA, USDA: NRCS, Rural Development, USCP

Universities: Univ. of Akron, Clemson, Morgan State Univ., NC State, Penn State, South Carolina State Univ., UMD, UMES, VA Tech, WVU



Key Milestones Achieved

- Our CRBBP Process was invented in 2016 and patented in 2018, while, our Torrefaction Process was patented, in 2012.
- In collaboration with the Electric Power Research Institute (EPRI), we have demonstrated our Bio-Coal as a superior, clean and renewable fuel, easy to co-fire in coal-fired power plants.
- Using our CRBBP Process, we have planted our Bio-Crops in Chesapeake Bay watershed farm soils, in Maryland, Pennsylvania and Virginia, to extract excess Nitrogen and Phosphorus, to protect aquatic life in the Bay.
- And, we plan to conduct new bio-crop plantings in Lake Erie's Western Ohio watershed, to protect the lake, and in a South Carolina rural, wastewater treatment plant spray field to keep operating and capital costs low, while improving water quality.
- We have demonstrated the superiority of and are creating markets for our Animal Bedding, Bio-Based Fillers and Biochar.



CRBBP Process: Competitors

A few companies, involved in CO 2 capture, are using very expensive mechanical processes. Others, like the following are using one, or two of ATP-MD's CRBBP Process activities:

- Richardson Seeds, Ltd.
 (<u>http://www.richardsonseeds.com/live/</u>) is involved in selling Biomass Sorghum seeds;
- Floating Islands International, Inc
 (http://www.floatingislandinternational.com/products/bioh aven-technology/) is involved in growing plants in waterbased, remediation islands; and
- Konza Renewable Fuels (<u>http://www.konzarf.com/torrefactionsystems.aspx</u>), is involved in making and selling torrefaction equipment.

However, ATP-MD is not aware of any companies sequentially integrating all four of ATP's, patented CRBBP Process activities.





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Appendix



Our CRBBP Process Uses Two Biological Processes

Photosynthesis: A process, by which plants and trees absorb atmospheric **Carbon Dioxide (CO 2)**, and convert it, along with water, nutrients and sunlight, into plant and tree material.

Phytoremediation: A process by which plant and tree roots uptake **Problematic Substances** from soil and water.



ATP-MD's CRBBP Process: "Circular Economy" Bio-Products



Risks & Risk Mitigation

ATP-MD faces Market Risks, as we work to encourage large CO 2 emitters to collaborate with us to demonstrate and ultimately use our CRBBP Process, and Market Risks, as we encourage other customers to buy the Bio-Products we produce.

Although we have demonstrated the efficacy of **Bio-Coal** and our other **Bio-Products**, we face Technology Risks in designing and implementing our new **VBF** application, even though vertical farming has successfully demonstrated its efficacy, for certain types of crops.

Our two, patented processes, and the cost advantages of our **CRBBP Process** provide some protection from competition.

We maximize risk mitigation, by closely collaborating with our university and industrial partners and by the careful design and demonstration of our integrated and patented CRBBP Process, hopefully with and ultimately at, large CO 2 emitters.



Use of 2c2i Funding in Year 1

\$25,000 in 2c2i Funding, plus the \$30,000, already in hand, along with grant pending will fund the following proposed Year 1 Budget of \$107, 250:

- Demo VBF Design
- Bio-Product R&D
- Bio-Crop Test Plantings
- Operating Expenses
 - <u>47,250</u> Total \$107,250

\$40,000

15,000

5,000



Schematic of Our Patented Torrefaction Process





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