# Ekocoke™: From Coal to Coke and Mesophase Pitch

Business Plan

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May 2022

## Executive Summary

### Products

A single plant running the Ekocoke™ process can be used to produce up to 250,000 tons of metallurgical coke annually along with 13,000 tons of coal mesophase pitch from nearly 450,000 tons of coal. Minor byproducts include natural gas and BTX.

### Customers

Healthy markets already exist for metallurgical coke and nearly all other byproducts of the Ekocoke™ process. Mesophase pitch has an established market, but the market is expected to grow as the use of pitch-based carbon fiber increases.

### Timing

As energy demands for coal continue to wind down, coal mining and coal processing communities are facing continued threats to economic sustainability. To minimize economic disruption to coal-driven communities, alternative uses for coal should expand concurrently with the decrease in usage in the energy industry.

## Company Description

### Purpose

To fulfill demand for metallurgical coke and coal pitch while providing continuity to coal mining and coal processing communities.

### Current Stakeholder Organizations and Contributors

Combustion Resources Craig Eatough (President)

Ekomatter Steven Fausett (CEO)

Seven Counties Infrastructure Coalition Mike McKee (Executive Director)

UAMMI Dr. Tulinda Larsen (Executive Director)

UAMMI Guy Letendre (Deputy Director)

Weber State University Dr. Evan Barlow (Assistant Professor)

Weber State University Dr. François Giraud-Carrier (Associate Professor)

## Market Research

### Industry

Although the Ekocoke™ process itself is novel and has never been implemented at full scale, the majority of its products are commodity chemicals with mature markets. The one exception is coal pitch. While there is an established market for coal pitch, its market is not as reliable or stable as the other products of the Ekocoke™ process. However, with the likely expansion of the coal-pitch-based carbon fiber market, demand for coal pitch is likely to increase beyond current levels.

### Process Advantages

The Ekocoke™ process has the following advantages:

* The ability to produce higher-value metallurgical coke from even low-grade coal
* A closed-cycle process with a low environmental footprint
* A use for coal outside of the energy industry
* Up to 450,000 tons of coal per year for a full-scale plant

## Products

### Products and Current Prices

A full-scale plant running the Ekocoke™ process generates the following products (with associated annual revenues):

|  |  |  |  |
| --- | --- | --- | --- |
| **Byproducts-Sell** | **Price per lb** | **lbs/month** | **$/year** |
| Benzene Toluene Xylene (BTX) | $0.19 | 2,963,520 | $6,579,014.40 |
| Natural gas(\*) | $31.68 | 16,560 | $6,294,664.29 |
| Coal Tar | $0.20 | 2,054,160 | $4,806,734.40 |
| Sulfuric Acid 98% | $0.34 | 2,030,400 | $8,270,875.01 |
| Coke | $0.14 | 41,645,520 | $68,715,108.00 |
| Anhydrous Ammonia | $0.98 | 708,480 | $8,331,724.80 |
| Mesophase pitch | $0.30 | 2,208,960 | $7,952,256.00 |
| **Total Revenue per Year** | | | **$110,950,376.90** |

(\*) Flow rate is in MWh not lbs/hr. Therefore, price is in $/MWh

As seen in the table, metallurgical coke generates the greatest amount in annual revenue. Minor byproducts make up nearly 40% of revenue.

### Intellectual Property Rights

The Ekocoke™ process is protected by intellectual property rights. The company using the Ekocoke™ process will need to pay licensing fees.

## Strategy

### Startup

### The Ekocoke™ process has already been scaled up to pilot plant levels in the past by the Ekomatter company. The business case economic analysis presented in this business plan assumes that the process is not piloted again. Instead, the Ekocoke™ process is assumed to be constructed to full scale (*i.e.*, 250,000 tons of coke per year) during the first year after initial investment. Operations commence at the beginning of the second year.

### Startup Financing

Ideally, the funds to build the manufacturing facility will come from a combination of private, banking, and public sources. Public funding is limited to real estate and other tangible items that would continue to hold value even if Ekocoke™ process operations were halted. Because of the uncertainty surrounding availability of public funding, however, this business plan makes the most conservative assumption that no public funding will be available. Thus, the startup costs used in the business case analysis are close to a worst-case scenario. The business case analysis used for the economics presented here assumed that private funds account for 25% of the startup costs while loans account for the remainder.

### Ties to Carbon Fiber

The Ekocoke™ process was first investigated by the authors of this business plan because of the Department of Defense’s decision to designate low-cost carbon fiber as a strategic priority. While other processes can generate a larger yield of coal pitch (and thus a greater amount of carbon fiber per ton of coal), the Ekomatter process has weaker ties to the carbon fiber industry; so even if coal-pitch-based carbon fiber experiences a weaker-than-expected market reception, the company running the Ekocoke™ process remains financially viable. If, however, the coal-pitch-based carbon fiber market grows and if additional high-value uses are found for coal pitch, the financial viability of the Ekocoke™ process becomes slightly more attractive. In addition, the Ekocoke™ process generates a sufficient amount of coal pitch to largely satisfy the requirements of the Department of Defense.