



**INNOVATION PLAN**  
**Madison West High School**  
**30 Ash St**  
**Madison, Wisconsin, 53726**  
**Barkai Lazimy, Ian O'Russa, Asante Malloy**  
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# I. EXECUTIVE SUMMARY

## Nova Caeli Overview

Our mission is to build a better world for future generations, through sustainable emissions reduction. Nova Caeli means fresh air in Latin, which truly embodies our company's mission to improve the environment, using technology, at a global scale. We plan to accomplish this through capturing carbon and transforming it into beneficial and sustainable organic products. It is our goal not only to provide affordable carbon capture solutions, but to become a beacon of hope for future generations.

## Problem

Climate Change is a crisis that affects everything on earth. 2023 was the hottest year on record, and temperatures are still rising.

Industries produce nearly 50% of American carbon emissions, and most of the companies responsible do not have a plausible way to counter their emissions. These corporations are also faced with increased regulations regarding mitigation of carbon emissions.

The production of harmful organic materials is not sustainable. Production of plastics, ammonia, and corn ethanol are examples of harmful organic materials that have drastically negative impacts on the environment in their production.

## Target Market

Direct Air Capture Market: Companies that don't directly emit carbon dioxide

Post Combustion Market: Companies without easy carbon dioxide mitigation

Carbon Utilization Market: Consumers that buy organic products

## Unique Value Proposition

Affordability: All of the materials used in our carbon capture design are common and low cost.

Low Complexity: Our design is not complex and requires little if any maintenance. It is powered renewable and is easy to operate at any scale.

Byproducts: The byproducts produced are safe and easily reused in countless practical applications.

## Solution

Carbon capture technology absorbs carbon dioxide from the atmosphere, which lowers emissions and greatly benefits the environment, and mitigates climate change.

Our new post-combustion technology is specifically meant to mitigate emissions from hard to abate industries, while also being affordable enough that all companies can lower emissions and follow regulations.

Organic materials produced from carbon capture will be utilized in our Nova Substantia product line, which is committed to only using our processed materials to produce 100% carbon negative and sustainable products.

## II. PROBLEM

### Problem 1 Greenhouse Gas Emissions

- 2023 was the hottest year on record.
- Global average temperatures are 1.37 degrees celsius higher than pre-industrial averages. To put this into perspective, a 1-2 degree celsius drop led to the Little Ice Age.
- Greenhouse gas emissions have increased from 2000 by 32%, despite goals of reducing emissions from governments and corporations globally.

As global pressure to reduce emissions rises, governments are increasingly passing emission reduction regulations. The EU has already passed regulations requiring companies to go carbon neutral by 2050. Currently the cost of emission reduction technology is inhibitively high for most companies looking to achieve carbon neutral status.



### Problem 2 Hard to abate industries

Some industries have no practical ways to reduce emissions voluntarily or as required by governments. These industries must continue to burn fossil fuels. As a result, in order to meet government regulations, they will need specialized emission reduction technologies that are currently not cost effective. Additionally, these hard to abate industries, specifically steel and cement, are some of the most responsible for global emissions. The cement industry alone makes up 7% of total carbon dioxide emissions, and the steel production industry accounts for 6-9%.

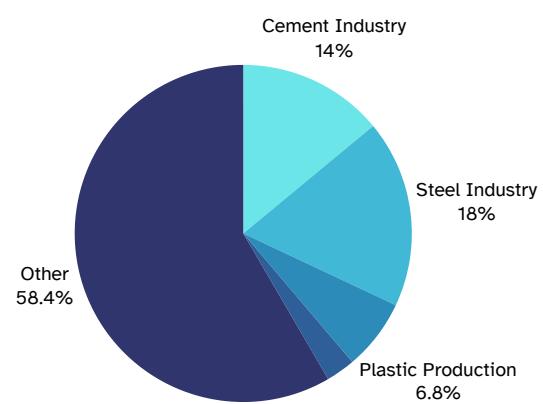


### Problem 3 Production of Organic Materials Using Fossil Fuels

- Plastics are one of the most abundant and harmful organic materials produced by industry. The production of plastics totals 3.4% of all global carbon emissions.
- Agricultural production and production of ammonia-based fertilizers accounts for 1.4% of global emissions and consumes 1% of global energy production.
- The production of biofuels harms ecosystems and produces more greenhouse gasses than it saves.

The production of these organic materials is not only hard to abate, but also requires fossil fuel production for the supply of raw materials. To become carbon neutral these companies will need to find non fossil fuel-based sources of chemical feedstocks.

### % of Industrial Emissions



### III. CUSTOMER SEGMENTS

#### Direct Air Capture Market

The direct air capture market is our primary customer segment. This mainly includes companies that don't directly release carbon dioxide into the atmosphere. Companies looking to make carbon neutral pledges or voluntarily reduce their carbon footprints can benefit from our direct air capture products, which do not have to be located in proximity to direct emission sources. These companies form the voluntary carbon market, which was already worth **2 billion USD** in 2022. Additionally, companies that may be required by government regulation to offset their indirect emissions can utilize our direct air capture products to remove carbon dioxide on their behalf. This carbon credit market was valued at **87.9 billion USD** in 2022 and is set to grow at a compound annual growth rate (CAGR) of 14.2% from 2023 to 2032.

#### Carbon Utilization market

Nova Caeli transforms captured carbon into a variety of organic materials including Nylon, PVA, PVC, and ethanol and other plastics. Third party companies may also pay Nova Caeli to process their carbon as well. Overall, the carbon utilization and storage market in 2022 was worth **2.1 billion USD** and is expected to grow at compound annual growth rate (CAGR) of 7.5-13.3% between 2023-2032.



Nylon Market - valued at **\$31.33 billion USD** in 2022 - CAGR 5.1%



PVC Market - valued at **\$45.52 billion USD** in 2022 - CAGR 4.84%

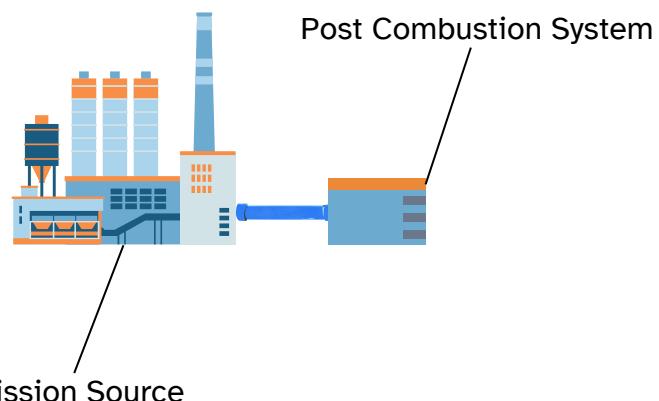


PVA Market - valued at **\$791.7 million USD** in 2022 - CAGR 6.3%

#### Post Combustion Market

Nova Caeli post combustion products will be sold primarily to companies in hard to abate industries. These systems capture carbon dioxide directly at sources of emissions in steel and cement plants. Governments are likely to place tighter, more specific regulations on these industries, which will strengthen the market for our products.

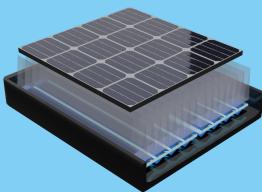
#### Post Combustion Model



## IV. UNIQUE VALUE PROPOSITION

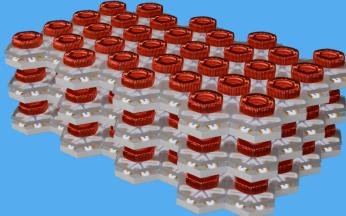
Nova Caeli aims to satisfy the ever-growing global demand for carbon capture solutions through innovative and cost-effective technologies, while practicing sustainability in all operations. The relatively high cost of operating other carbon capture systems prevents companies from achieving viable emission reduction. On average, existing direct air carbon capture solutions costs \$127-342 USD/Tonne CO<sub>2</sub>. Comparatively Nova Caeli direct air capture systems cost at least 42% less than this at only \$32-70 USD/Tonne CO<sub>2</sub>. Nova Caeli also leads the market in unit cost with our systems being constructed almost entirely with affordable and recyclable materials such as plastic, steel, sodium hydroxide and ceramic. Furthermore, the system is entirely electric and involves no moving parts, decreasing maintenance costs significantly. It is also constructed from modular units and can be easily scaled to meet the requirements of operating on a global scale.

While some would argue that plants and trees are an effective form of carbon capture, this is not the case, as these organisms release carbon dioxide back into the atmosphere when they die. Unlike trees, carbon capture systems must store carbon dioxide for a long period of time, which is by far the costliest part of all emission reduction solutions. Rather than incur this massive cost, Nova Caeli has avoided this expense entirely. Our carbon capture process produces Hydrogen and Oxygen in excess, allowing us to create beneficial, carbon negative organic compounds using only captured carbon and water. Then, we will sell these raw materials to consumer product manufacturing companies. Motivated consumers are more likely to buy manufactured products branded as carbon negative, despite the cost of these organic raw materials being slightly higher than market values. To accomplish this, we have worked closely with our partners at Patagonia to create an environmentally friendly clothing line as well as a variety of other products using our carbon negative nylon feedstocks. By converting captured carbon, we not only avoid costs of storage, but we also make additional income through the sale of organics. Decreasing costs as a result of government policy, along with a need for carbon capture due to increased regulations, will drive increases in profits and establish Nova Caeli carbon capture as a mainstay in emission reducing technology.



Direct Air Capture

- Unit Cost: **\$120 USD.**
- Solar powered.
- **\$32-70 USD/Tonne CO<sub>2</sub>.**
- Scalable units.
- Operates in any location.



Post Combustion

- Unit Cost: **\$750 USD.**
- Hard to abate industries.
- Greater rate of CO<sub>2</sub> capture.
- Low maintenance costs.
- Operates at source of Emissions.



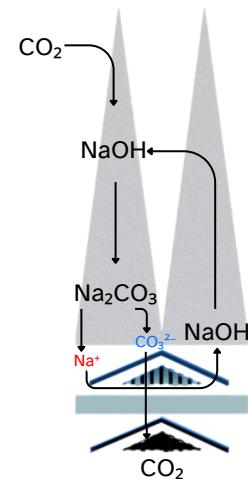
Carbon Negative Products

- Price Varies.
- Materials include Nylon, PVC, PVA, Ethanol, polyethylene, QA, polypropylene, and Mylar.
- Savings on CO<sub>2</sub> storage + income from sale
- Collaboration with clothing brands

## V. SOLUTION

### Carbon Capture Technology

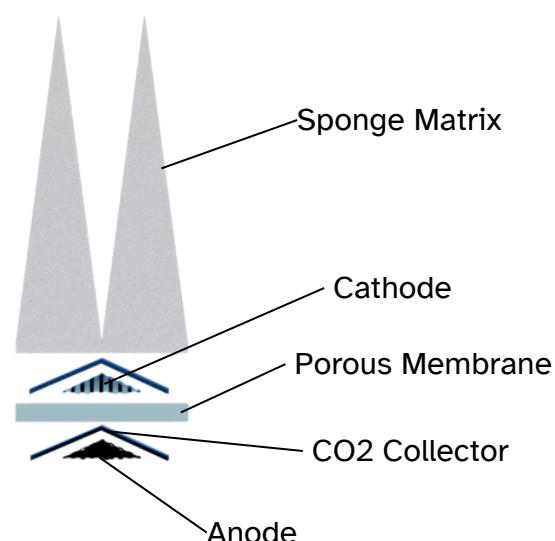
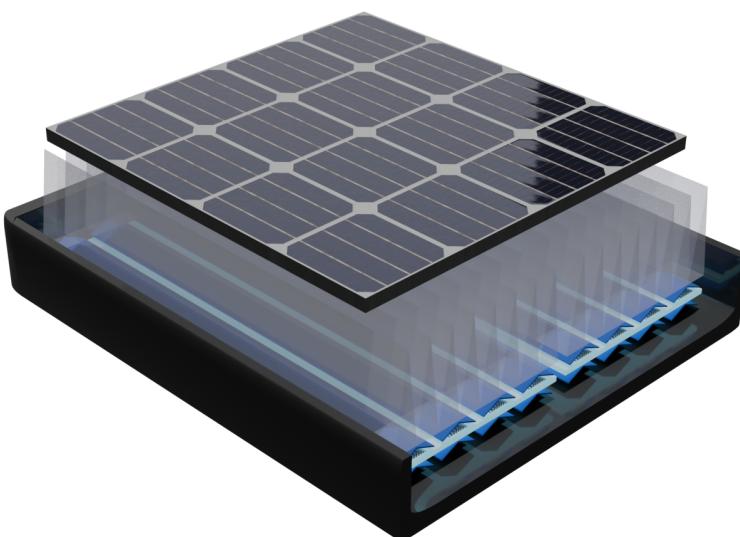
Nova Caeli carbon capture products utilize a new carbon capture method which was created specifically to address global climate issues. We are the first company to document this unique approach, optimized for efficiency and simplicity at scale. Each of our products are implemented differently, however they all rely on the same electrochemical technique. First, a sodium hydroxide solution ( $\text{NaOH}$ ) is exposed to the air through a sponge matrix, where it then binds to atmospheric carbon dioxide ( $\text{CO}_2$ ), forming sodium carbonate. This inexpensive sodium ion solution is used as a carrier for carbon molecules throughout the system. Next, the carbonate ions are separated from the solution, leaving the sodium ions to be re-utilized. This is accomplished through an electrolytic cell that converts electrical energy into the chemical energy which is required to split sodium carbonate. A positively charged electrode called an anode attracts negatively charged carbonate ions ( $\text{CO}_3^{2-}$ ). The anode is coated with a thin layer of platinum to prevent corrosion. Simultaneously, a negatively charged electrode called a cathode attracts positively charged sodium ions ( $\text{Na}^+$ ). A ceramic porous membrane is located between both electrodes to prevent the carbonate ions from recombining with the sodium ion solution. As a result of this process, concentrated  $\text{CO}_2$  bubbles out of solution to be collected and processed into beneficial organic materials. At the cathode sodium ions form sodium hydroxide, which permeates the sponge matrix and continues to react with additional carbon dioxide molecules.



If no sodium hydroxide is available, sodium carbonate (baking soda) can be loaded into the cathode chamber. The system will automatically convert this entirely to sodium hydroxide after two days of continuously running.

### Direct Air Capture Solution

The Nova Caeli direct air capture system efficiently combines all of these processes into a self-contained unit with no moving parts. Our direct air capture system directly collects  $\text{CO}_2$  from the surrounding atmosphere. The system's flat and modular design, in combination with its low energy consumption, allows it to be easily deployed below solar panels making the system entirely sustainable.

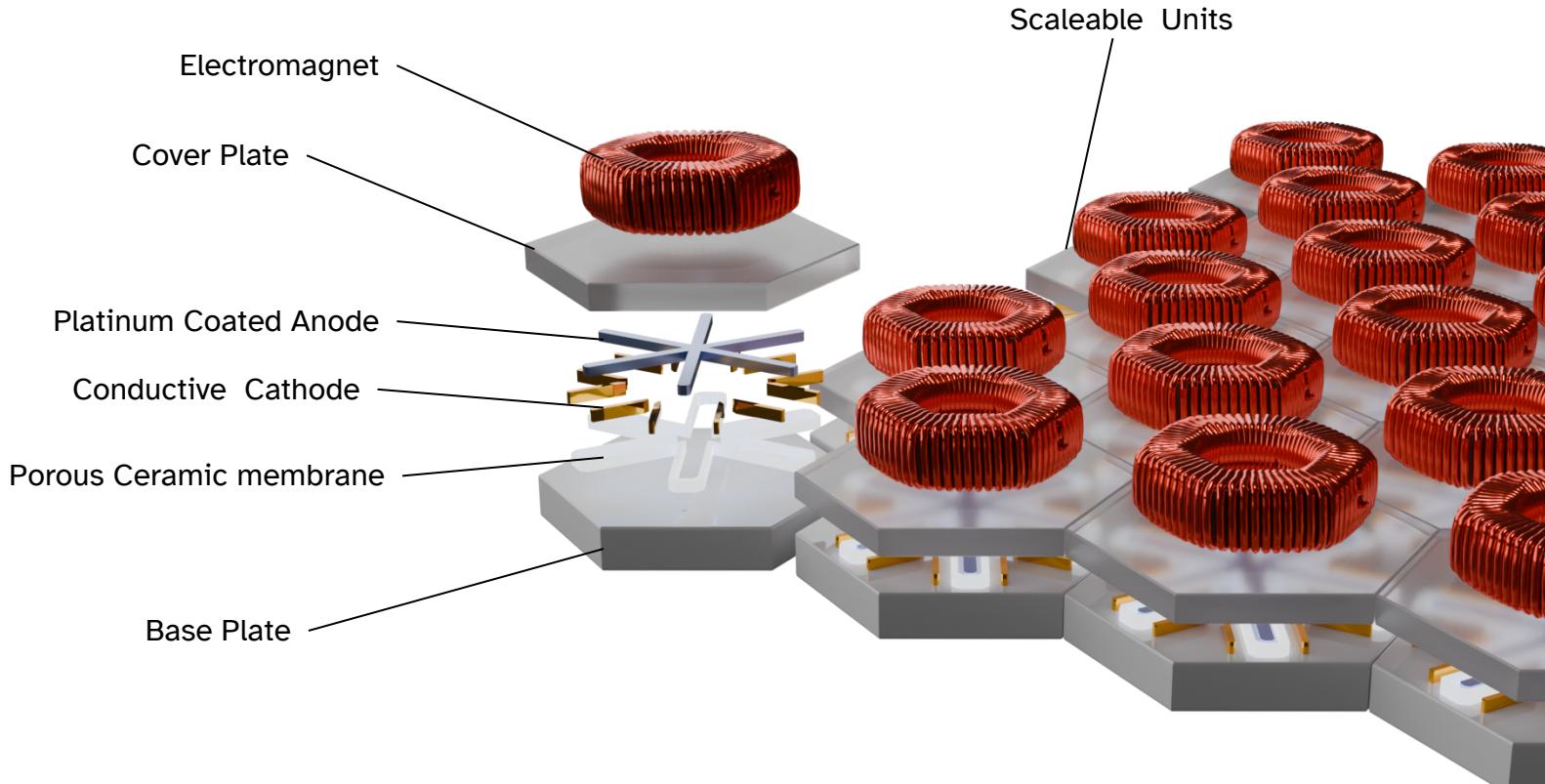


## Post Combustion Capture Products

Our post-combustion product line has been developed specifically for hard to abate industries. This version of our device is optimized to operate at direct sources of emissions with high carbon dioxide concentrations and high gas turnover rates like those of steel and cement plants. The post combustion product line takes advantage of these conditions to remove CO<sub>2</sub> at a significantly higher rate while using power more efficiently, when compared to our direct air capture products. These increases in performance are a result of greater surface area along with the addition of a unique magnetohydrodynamic drive technology. The magnetohydrodynamic drive utilizes the existing electric field created by the electrolytic cell in combination with a magnetic field generated by electromagnets (magnets that need electricity to function) to propel internal fluids and products through the system. Moving fluids through the system eliminates the need for separation of product gasses, utilizing less space and removing more carbon dioxide. Additionally, this technology also used in space applications adds minimal complexity or maintenance, running entirely on electricity and involving no moving parts.

## Utilizing Carbon Dioxide to Manufacture Beneficial Organic Materials

Carbon dioxide captured through Nova Caeli systems will be transformed into our secondary line of products: Nova Substantia™. This is possible because our carbon capture systems produce hydrogen and oxygen in excess. Hydrogen and oxygen by-products can then be combined with carbon to form a wide variety of organic molecules. Nova Substantia focuses on materials with the highest production and cost efficiencies mainly Nylon, PVC, PVA, Ethanol, polyethylene, QA, polypropylene, and Mylar. Instead of having to store carbon Nova Caeli is able to produce usable products. To accomplish this we have collaborated with companies like Patagonia and North Face, which have access the consumer market. We seek to collaborate with other companies and provide feedstocks for industries, as we grow the market of carbon negative organic products.



## VI. CONCLUSION

Government policy not only creates a demand for Nova Caeli products but also provides our company with a number of financial benefits. The Inflation Reduction Act grants Carbon capture manufacturers large tax credits equal to 30% of qualified investment costs.

Additionally the Department of Energy Loan Programs Office has \$40 billion in loan authority for innovative clean energy technology such as carbon capture. Over the past three years our initial investments have begun to pay off, last year our company had positive Net Income for the first time.

### Revenue Statement

Revenue	Year 1	Year 2	Year 3
Direct Air Capture	\$30,264.00	\$64,584.00	\$106,392.00
Post Combustion	\$5,238.00	\$13,968.00	\$20,079.00
Organic Products	\$3,673.00	\$14,632.00	\$35,912.00
Gross Revenue	\$39,175.00	\$93,184.00	\$162,383.00
COGS	Year 1	Year 2	Year 3
Direct Air Capture	\$23,280.00	\$49,680.00	\$81,840.00
Post Combustion	\$4,500.00	\$12,000.00	\$17,250.00
Organic Products	\$3,305.70	\$13,168.80	\$32,320.80
Gross COGS	\$31,085.70	\$74,848.80	\$131,410.80
Net Revenue	\$8,089.30	\$18,335.20	\$30,972.20
Expenses	Year 1	Year 2	Year 3
Research and Development	\$11,000.00	\$5,000.00	\$5,000.00
Marketing	\$2,000.00	\$2,000.00	\$2,000.00
Capital Investment	\$46,000.00	\$25,000.00	\$11,000.00
Gross Expenses	\$59,000.00	\$32,000.00	\$18,000.00
EBT	-\$50,910.70	-\$13,664.80	\$12,972.20
Income Tax Expense	0	0	\$2,724.16
Net Income	-\$50,910.70	-\$13,664.80	\$10,248.04

	Direct Air Capture	Post Combustion
Cost Per Unit	\$120.00	\$750.00
Price Per Unit	\$156.00	\$873.00
# of units sold each year		
Year 1	194	6
Year 2	414	16
Year 3	682	23

Nova Caeli embodies something that has never been done before at this scale. We seek to change the face of emissions mitigation and set a new industry standard when it comes to reducing CO2. The time is now for change in the industry, and our product perfectly fits the new and rapidly growing market for carbon capture. Nova Caeli is affordable, high quality, and sustainable. Our low cost due to using affordable materials, along with benefits from the Inflation Reduction Act, allows carbon capture to reach a new high in a market that has consistently struggled with affordability. This allows not only large industries to offset emissions at a low cost, but also smaller businesses who would benefit from carbon capture but previously couldn't afford the high price. Even with this low price however, our products are still manufactured with high quality standards in mind. The scalability and relatively low complexity allow for our products to be simple to consumers without compromising on functionality. Finally, we believe in practicing what we preach, so our product is completely carbon negative, with even the production process using 90% recyclable and environmentally friendly materials. Along with our production being environmentally responsible, the beneficial organic materials produced from the process are processed to create more environmentally friendly products that we showcase through our partnership with Patagonia. In conclusion, we believe that Nova Caeli will change the world, one carbon capture machine at a time.

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## VIII. APPENDIX

### Beneficial vs Harmful Organic Materials

Beneficial organic materials produced by us are incredibly different from the harmful organic materials produced by other companies. When CO<sub>2</sub> is captured, hydrogen, oxygen, and small amounts of carbon are produced. Allowing for the production of organic hydrocarbons. While there are beneficial uses such as our carbon negative nylon, there is the potential for the production of harmful organic materials such as plastics, ammonia, and corn ethanol biofuels which produce emissions and are harmful to the environment. The rampant production of harmful organic materials is why our company's commitment to only producing environmentally friendly products is so important, as with Nova Substantia™ we can set a precedent for the rest of the industry in organic material production.