



# 2022 ECLIPSE CARBON OPTIMIZATION (ECO) REPORT

Quantifying Sustainability for Technologies Enabling the Industrial Evolution



Powered by **CRANE**  & in partnership with **RHOIMPACT** 





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## EXECUTIVE SUMMARY

### Physical industries are at their breaking point.

In recent years, it has become even more evident that our physical industries bear the greatest responsibility for fulfilling the needs of people worldwide. Yet, the aging systems and processes upon which physical industries were built have brought forth dire consequences – our environment is at a critical juncture, and if we do not act now, the well-being of our society and planet will be jeopardized. Furthermore, the aging infrastructure upon which these industries operate no longer supports the kind of agile productivity that is needed to maintain a strong economy, sustainable growth, and adherence to cleaner environmental practices and policies. Until today, we have lacked a purpose-built tool to make a strong sustainability case for new technologies and their carbon reduction potential.

In addition to being responsible for three-quarters of global GDP, physical industries, including agriculture, industrial manufacturing and transportation, account for [75% of global greenhouse gas \(GHG\) emissions](#). The United States alone emits roughly 7 billion metric tons of CO<sub>2</sub>e (carbon dioxide equivalent) annually. This equates to about 16% of the 43 billion metric tons of CO<sub>2</sub>e emitted on an annual basis around the world.

The disruptions in our supply chains leading to inflation and general product shortages result from prolonged insufficient investment in our physical industries. Perhaps less clearly understood is that our underfunding in physical industries, particularly concerning the energy sources and the infrastructure they rely on, plays a significant role in the continued increase in carbon emissions. For example, many of our U.S. power grid components are decades old, with [70% of power transformers and](#)



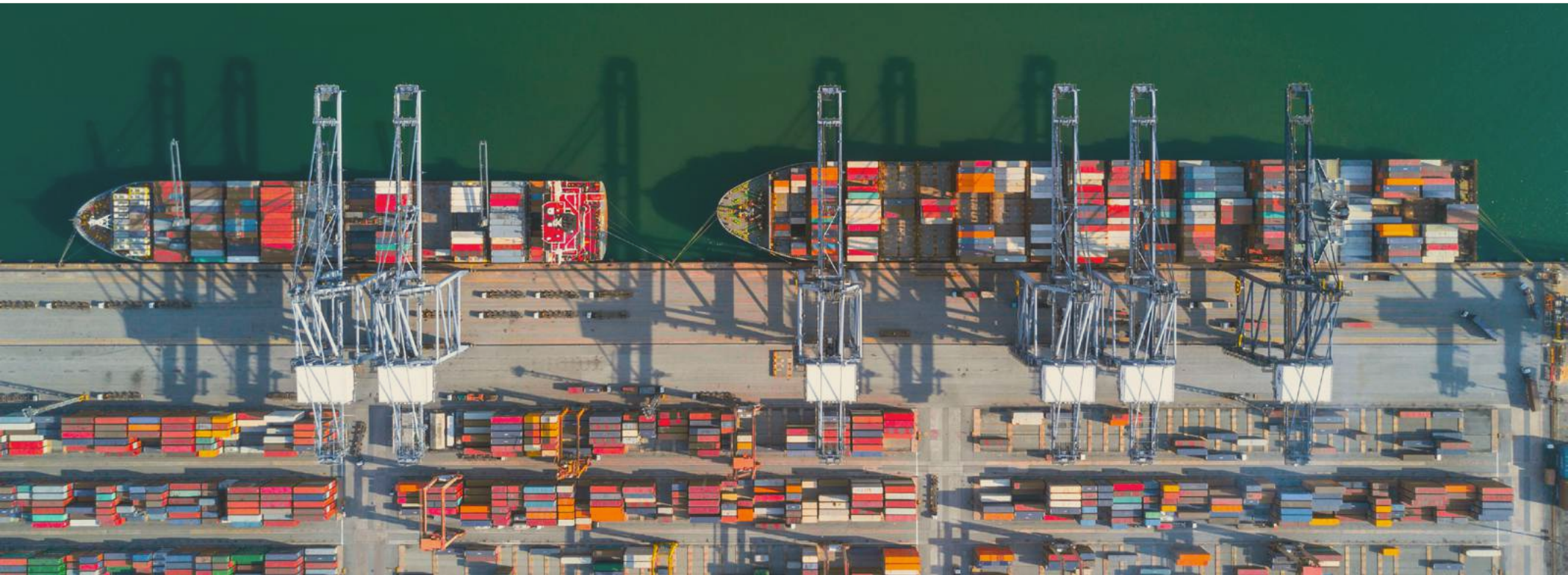
[transmission lines dating back twenty-five years](#). So, it's not surprising that our 20th-century energy grid loses approximately 5% of all electricity through transmission and distribution. For context, [that lost energy could power all seven countries in Central America four times](#).

Investors have tools to quantify resiliency and efficiency as the economic ROI (return on investment) on any given technology. What has been missing is an equivalent mechanism to measure sustainability and calculate the future environmental value potential of new technologies. In an era of 'greenwashing,' the ability to accurately chart how sustainable a business is now and into the future is valuable in two ways: first, it provides a means for companies to better communicate how their technologies can and will make a positive and significant impact on climate change and, second, it addresses in depth a topic of increasing importance to all interested stakeholders.

An added bonus for sustainable companies is they boost cost savings as they adopt processes that increase efficiency. Quantifying sustainability is mission-critical for investors to better identify and communicate the technologies that will reduce the carbon intensity of our physical infrastructure. Our society desperately needs such investments to reverse climate change, improve economic resiliency, and accelerate growth to drive the next massive wave of transformation — an all-encompassing Industrial Evolution.

The combination of economic and environmental value proposition is critical at Eclipse Ventures. If customers cannot improve their economic bottom line through cost reduction and/or additional revenue generation, wide-scale adoption of sustainable technologies will be challenging.

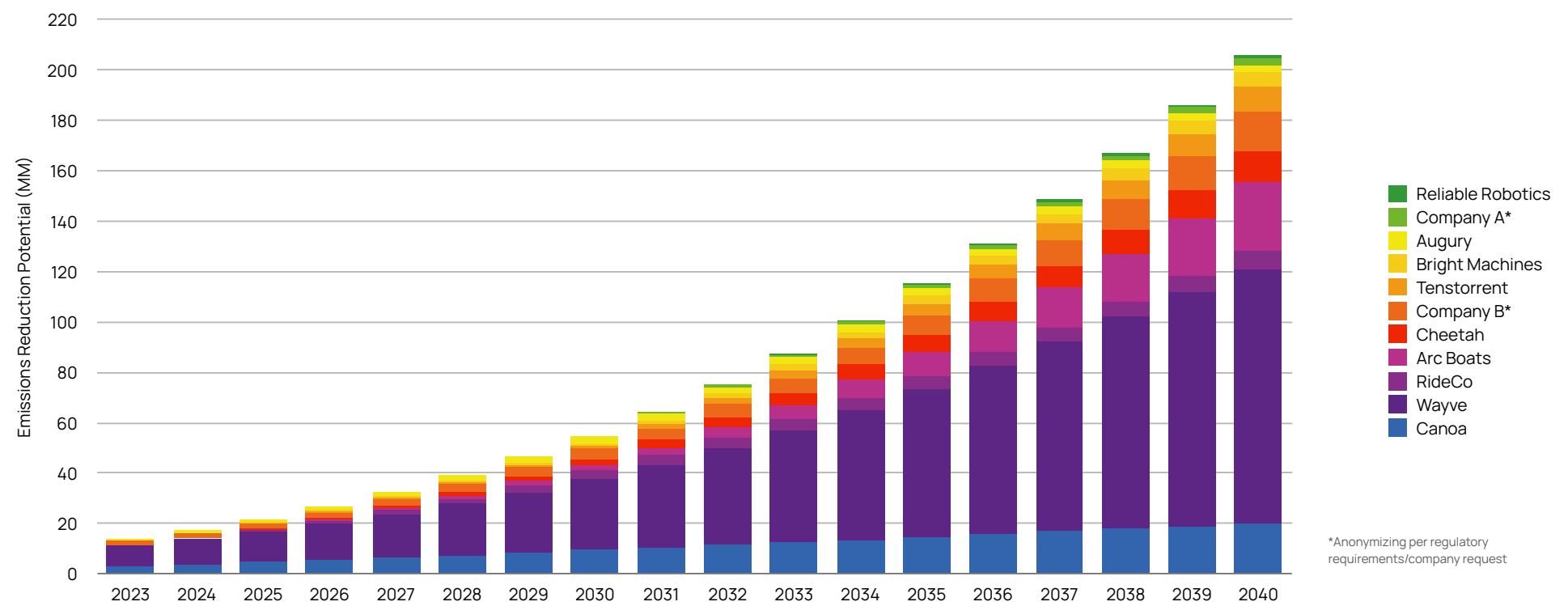
At Eclipse Ventures, we encountered this issue of a missing sustainability



mechanism first-hand when undertaking due diligence with founders, investors, and customers. We identified [CRANE](#), a tool developed by [Prime Coalition](#), a leading climate non-profit, which allows users to analyze the future potential environmental value proposition of new technologies in the same way they are used to assessing the economic value proposition. Utilizing CRANE, the Eclipse Carbon Optimization (ECO) framework is our approach to climate impact potential estimation.

In partnership with [Rho Impact](#), a climate advisory and implementation support provider, Eclipse Ventures used the ECO framework to assess a significant proportion of our portfolio when measured by asset value. Together, the 11 companies we measured have the potential to reduce annual emissions by more than 200 million metric tons of carbon dioxide equivalent (MMtCO<sub>2</sub>) (or 4% of total U.S. emissions) by 2040 (Figure 1). To put that figure in context, it is equivalent to removing approximately ~44 million internal combustion engine passenger vehicles from the road.

FIGURE 1  
AGGREGATE EMISSIONS REDUCTION POTENTIAL

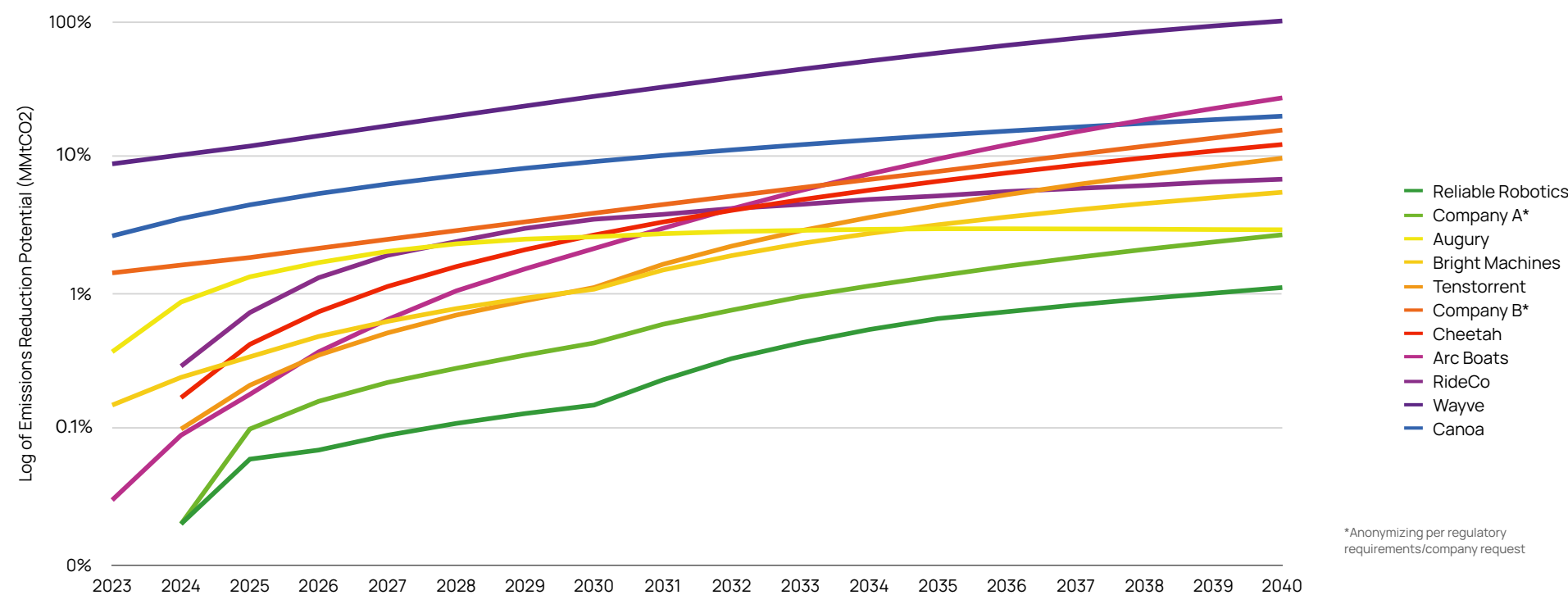


Importantly, our analysis recognizes the inherent challenge in making future predictions. ECO uses conservative assumptions for market penetration while also assessing both optimistic and pessimistic scenarios. Although many of our portfolio companies have the potential to reduce gigatons of CO<sub>2</sub>e, we focus on accuracy and want to set and manage expectations accurately.

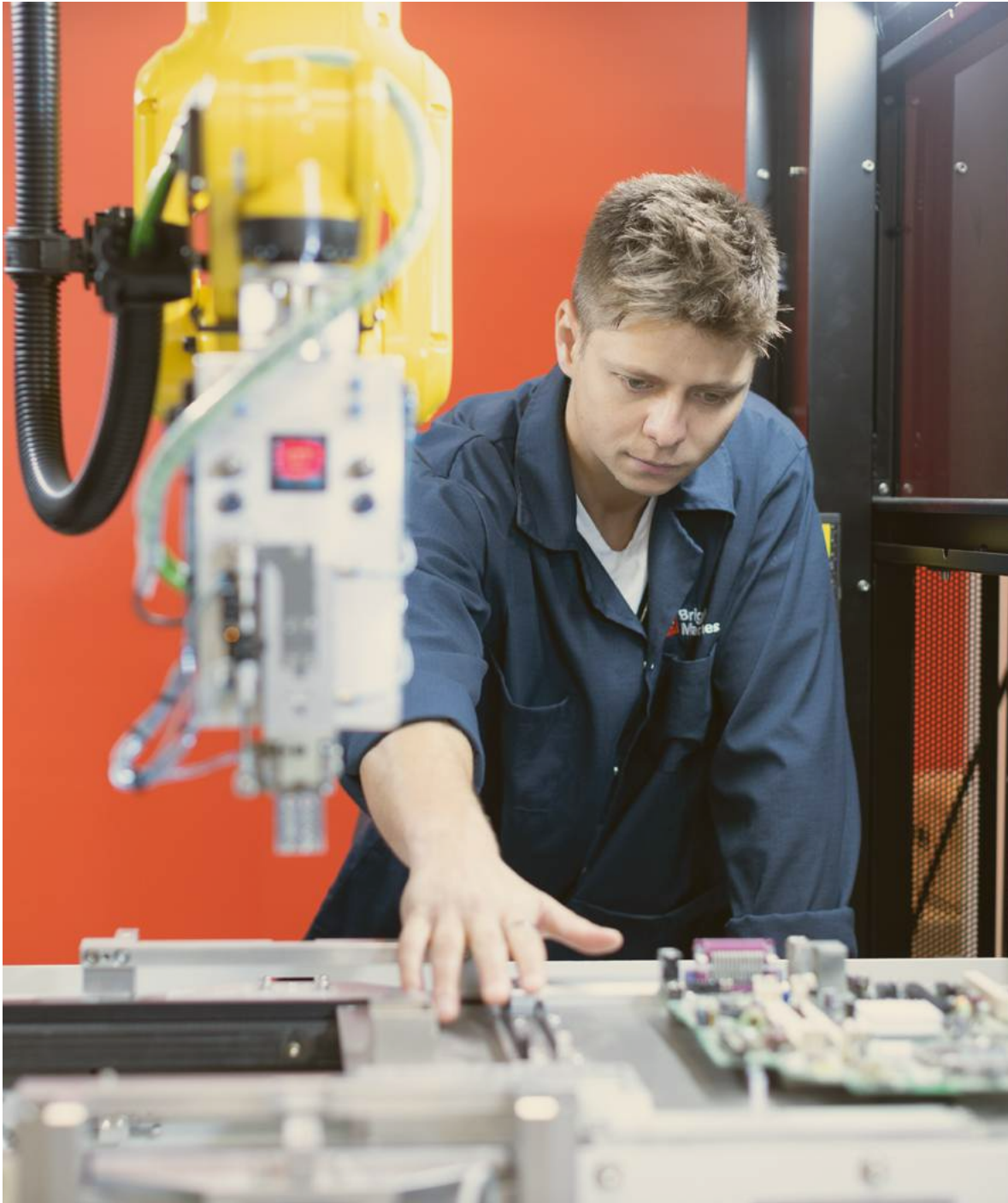
This report uses achievable market penetration assumptions, which are

often an order of magnitude below a technology's potential. For example, Tenstorrent is estimated to reduce data center emissions by ~25% and reach 10% penetration by 2040 in data center compute, which results in potential emissions reduction of ~10 MMtCO<sub>2</sub> of GHG emissions annually and 56 MMtCO<sub>2</sub>, cumulatively. We recognize the inaccuracy of estimating market penetration two years out, let alone twenty years out. Therefore, we apply large error bars to those assumptions with a downside scenario of only 2.5%

FIGURE 2  
ANNUAL EMISSIONS REDUCTION POTENTIAL BY PORTFOLIO COMPANY







penetration. Further, we do not assume Tenstorrent goes into new markets outside the data center, representing upside. We intend to update these assumptions annually, adjusting for faster / slower penetration, new markets, etc., with each annual report. These estimates are intended to be directionally correct, supported by in-depth research and logic, and made publicly available. We seek to be directionally correct and see our accuracy improve with each successive annual report incorporating incremental data as our companies grow.

Quantifying sustainability is mission-critical for investors to better identify and communicate the technologies that will reduce the carbon intensity of our physical infrastructure. Our society desperately needs these investments to reverse climate change, improve economic resiliency, and accelerate growth to drive the next massive wave of transformation — an all-encompassing Industrial Evolution.

We are excited to publish our inaugural ECO Annual Report, highlighting the carbon reduction potential of our portfolio while also showcasing each company's technological advancements already transforming our physical world. In sharing our approach and research, we hope to spark a more profound cross-industry debate among investors, founders, and customers about the need for and the importance of quantifying future sustainability for all technologies and measuring their impact on our planet.

## SUMMARY RESULTS

Category	Venture	Emissions of Target Market by 2040 (MMtCO2)	GHG Intensity Reduction (%) Per Functional Unit of Good or Service	Planned Annual Impact in 2040 (MMtCO2)	Planned Cumulative Impact by 2040 (MMtCO2)
Logistics/Supply Chain	Cheetah	549	9.5%	12	83
Automation	Bright Machines	382.4	51.6%	5.5	39
Automation	Augury	48.9	12%	2.9	43
Automation	Reliable Robotics	90.3	29.5%	1.1	7.3
Automation	Wayve	998.6	48.6%	101	781
Batteries	Company B*	600.2	43.6%	16	111
Electric Vehicles	Arc Boats	349.3	85.6%	27	133
Logistics/Supply Chain	RideCo	1309.9	53%	6.9	67
Material and Energy Efficiency	Canoa	430.5	93.3%	20	198
Material and Energy Efficiency	Tenstorrent	391.1	25.2%	9.9	56
Material and Energy Efficiency	Company A*	10.6	63.6%	2.69	16.89
<b>Total</b>		<b>5160.8</b>	<b>46.86% (Average)</b>	<b>204.99</b>	<b>1535.19</b>

Source: Rho Impact

\*Anonymizing per regulatory requirements/company request





## DEFINING THE ECO FRAMEWORK

The ECO Framework is powered by CRANE's model, which estimates carbon reduction much like an investor would evaluate an investment's future revenue and profit potential. So, similar to the formula of total addressable market (TAM) multiplied by value proposition (average selling price and profit) multiplied by market penetration to equal profit.

### **There are three primary components to the ECO Framework:**

- The estimated total GHG emissions in the market addressed by our portfolio technology.
- The estimated GHG emissions reduction potential of our portfolio technology.
- The estimated market penetration rate of our portfolio technology.

In the case of Eclipse Ventures portfolio company Company A, CRANE starts by estimating the total machined titanium parts market, which is sized at 85 kilotons globally, and converting that figure into its GHG equivalent of ~11 MMtCO<sub>2</sub> (see Figure 3). With ECO, we take into account both today's market and future market growth, so we are dynamically considering all existing technologies in the context of the future emissions market.

We quantify the potential for Company A to reduce GHG emissions compared to machining, the process which its technology is replacing. So, we consider the

reduction of scrap material, improved yield, localization, and offset by increased energy intensity of additive manufacturer lasers. Using ECO, we can determine that in comparison to the incumbent process, Company A reduces carbon intensity by ~64%.

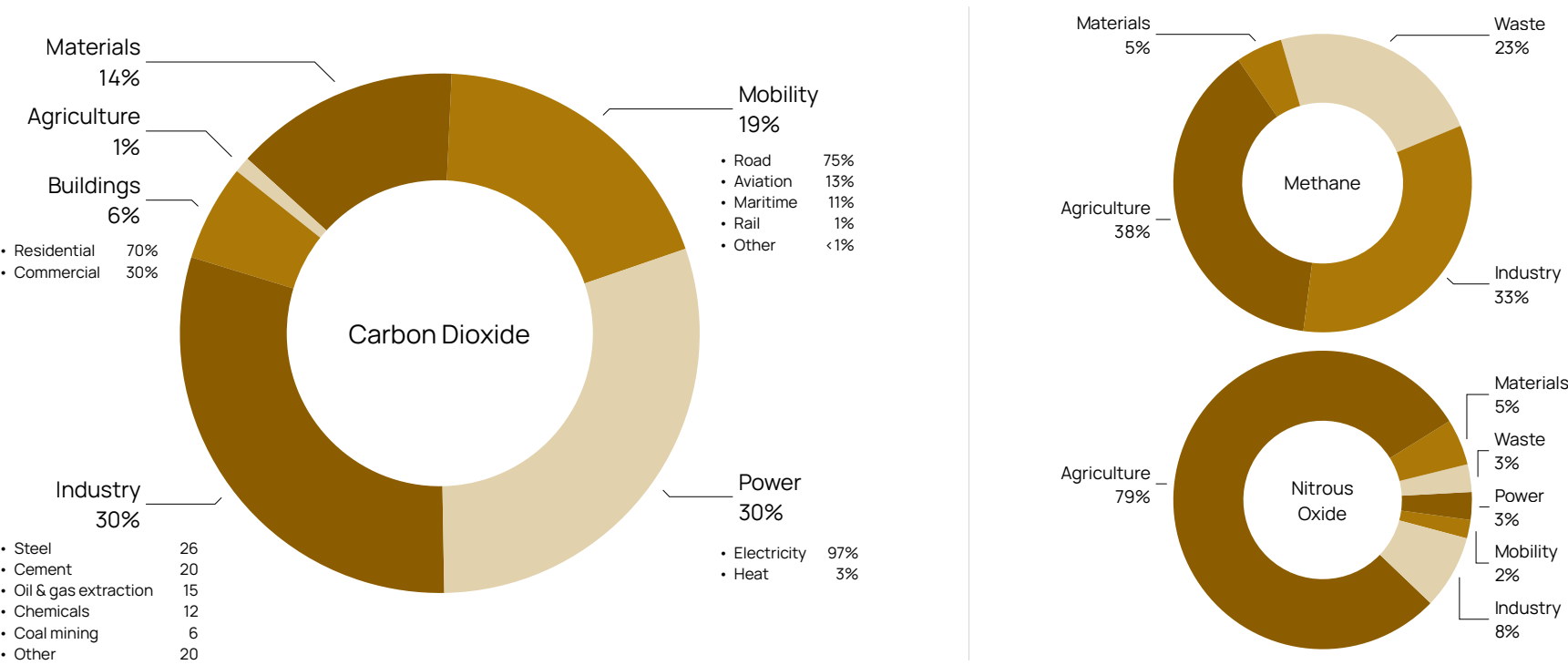
When looking at market penetration, we make our assumptions in increments (2025, 2030, 2035 and 2040), assessing that Company A, by 2040, will

produce 40% of all titanium parts in the existing market. We err on the conservative side with all of our estimations.

Combining total market with carbon reduction potential and market penetration, we end up with an estimated 2.69 MMtCO<sub>2</sub> in GHG emissions for Company A relative to the incumbent machining process.

FIGURE 3  
CARBON MARKET

Power and industry are major energy consumers and together generate about 60% of CO<sub>2</sub> emissions.  
Share of emissions per energy and land-use system, 2019, %







# INTRODUCTION

## **Our physical industries are in crisis.**

The combination of declining and inflexible infrastructure, an extended lack of serious investment, and a failure to embrace digital technologies have culminated in highly ineffective operations, which are also major polluters.

For example, in 2020, industrial processes, which include manufacturing, contributed 24% of all CO<sub>2</sub>e, while transportation accounted for 27% and electricity production 25%.

In total, the industries that Eclipse Ventures portfolio companies are targeting for digitization contribute more than three-quarters of all greenhouse gas (GHG) emissions.

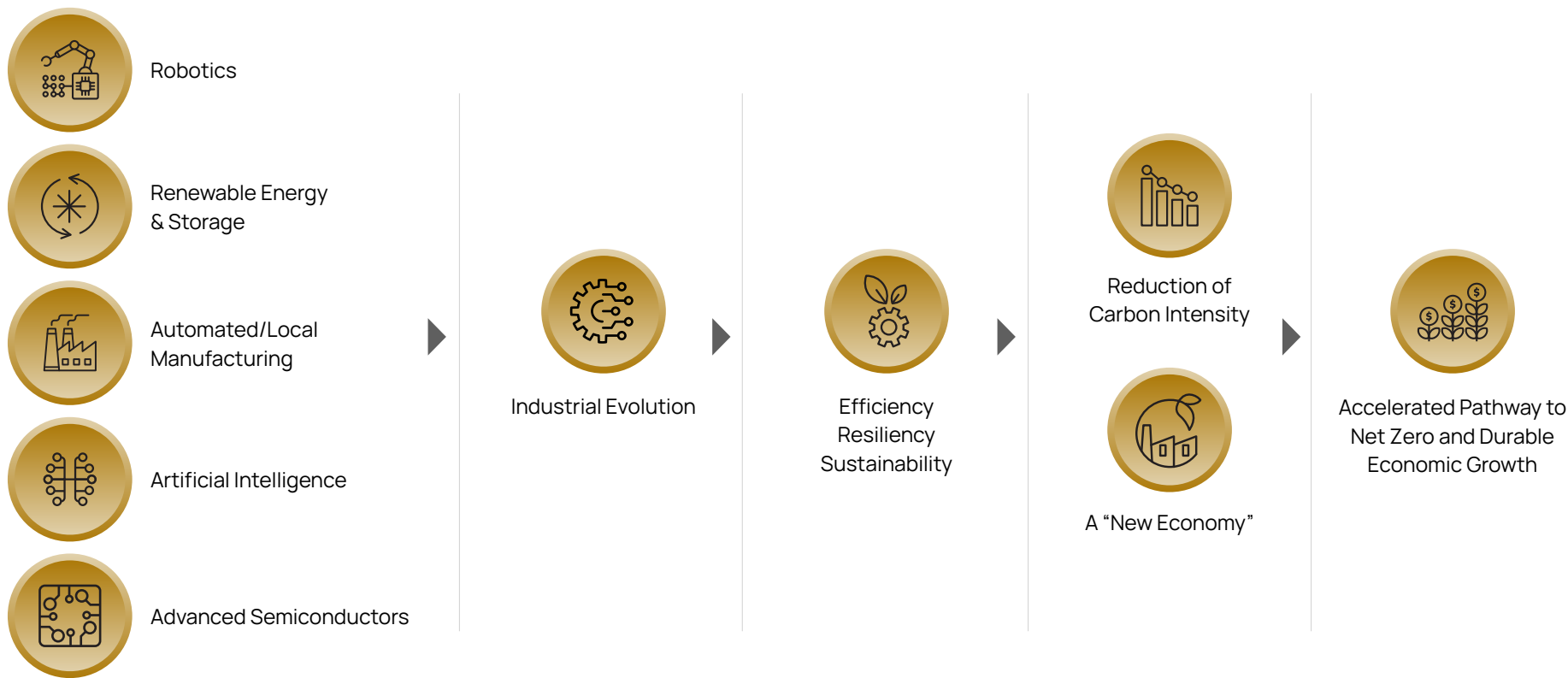
Investing in the technologies driving the Industrial Evolution (see Figure 4) not only improves economic resilience and efficiency, but also dramatically reduces emissions. Eclipse Ventures based our Eclipse Carbon Optimization (ECO) framework on CRANE, an open platform that will be open-source in the near future, with a verifiable and standardized methodology to calculate future emissions reduction. CRANE quantifies the reduction potential for ECO, which is Eclipse Ventures' approach to the sustainability of the Industrial Evolution.

With ECO, Eclipse Ventures and our research partner Rho Impact assessed 11 of our largest portfolio companies by asset value and determined that the cumulative portfolio has the potential to reduce carbon emissions by more than 200 MMtCO<sub>2</sub> annually by 2040.

Traditionally, the transformative technologies represented in our portfolio have primarily led with their economic value proposition in generating more revenue for customers, saving costs, and increasing reliability. However, ECO also allows us to capture and showcase these innovations' environmental value proposition. ECO enables Eclipse Ventures to analyze a technology's environmental impact more rigorously.

For example, Company B, an Eclipse Ventures portfolio company, has developed a 3D Lithium-ion battery that is over 2x more efficient than traditional battery designs. This battery enables the electrification of transportation and consumer products to proliferate at a faster rate than previously estimated. But how to quantify the future sustainability of an innovator like Company B? Applying CRANE's in-depth market and technology analysis, we determined

FIGURE 4  
REACHING NET-ZERO EMISSIONS WILL REQUIRE A  
TRANSFORMATION OF THE GLOBAL ECONOMY







that provided its products meet Eclipse Ventures' adoption estimates—which assumes 8% penetration of the total battery market—Company B has the potential to reduce carbon emissions by 16 MMtCO<sub>2</sub> annually. That reduction is equivalent to approximately ~11 million coast-to-coast flights across the U.S.

In our ECO 2022 Annual Report, we highlight individual portfolio companies and their overall carbon emissions reduction potential, while also examining their aggregate potential. We discuss why the modernization of our physical economy not only accelerates economic growth, but also increases industry resilience. Perhaps most critically, without these technologies, the world will not be able to decarbonize and reach the desired goal of net-zero emissions.

Our ECO 2022 Annual Report highlights individual portfolio companies and

their overall carbon emissions reduction potential while also examining their aggregate potential. We discuss why the modernization of our physical economy accelerates economic growth and increases industry resilience. Rapid physical technological advancements and their production at scale have eliminated any trade-off between economic and environmental arguments. For instance, today, photovoltaic cells can produce energy for less than \$0.10 per kWh, dramatically cheaper than fossil fuel. Building solar farms are far cheaper and better for the environment.

These kinds of technological advancements result in incredible economic growth through resiliency, efficiency, and sustainability, three qualities that define the mission of our portfolio companies and the justification for the existence of our firm.



## THESIS

**At Eclipse Ventures, we envision a world transformed by the Industrial Evolution where global gross domestic product (GDP) doubles every 25 years with a net-zero carbon economy.**

We will see a significant break in the traditional relationship between economic growth and carbon emissions. Instead of closely tracking each other, these two indicators will, for the first time, start to diverge from one another (see Figure 5).

Without dramatic changes to our physical infrastructure driven by emerging technologies, we will never reach net-zero.

Our five core investment areas are robotics, artificial intelligence, IoT, renewable energy and storage, and advanced semiconductors. In recent years, we have seen each of these technologies mature and reach an inflection point, and they are now primed for rapid adoption due to their dramatic value proposition. At Eclipse Ventures, we call the broad proliferation of these technologies the Industrial Evolution, transporting our physical industries into the digital world. The Industrial Evolution ultimately accelerates economic growth and drives a more sustainable, resilient economy.



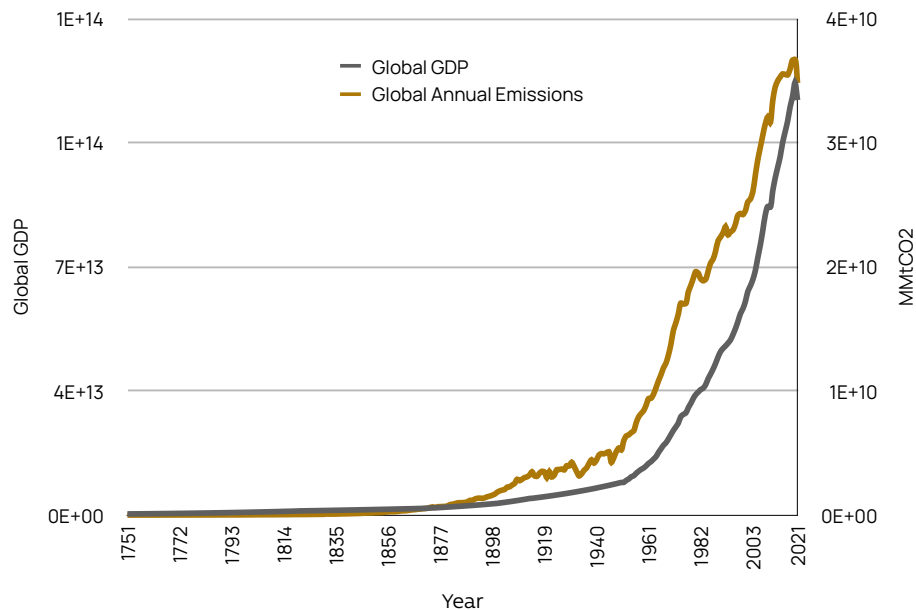
To understand the enormity of the innovations coming directly from the Industrial Evolution, we need to go back in history to the start of another massive transformation. At the onset of the Industrial Revolution in the late 18th century, the global economy began to experience exponential economic growth. This acceleration was heavily reliant on the consumption of fossil fuels and led to a similar exponential increase in carbon emissions.

The dramatic improvements in quality of life experienced by much of humanity over the past 250 years have always been accompanied by the negative impacts of climate change. But it isn't too late. Over the past few decades, technological advancements, including robotics, machine learning, and

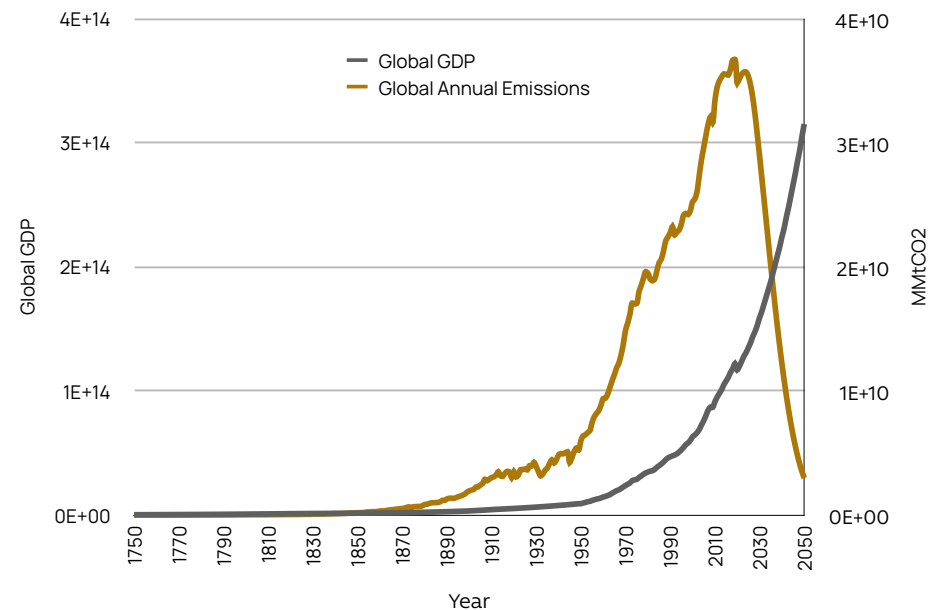
renewable energy technologies, have developed to the point where they are ready for rapid adoption across our physical economy. Eclipse Ventures sees a future where the technologies we focus on will drive economic growth and improve the quality of life for humanity while also contributing to the decline in carbon emissions.

The ECO Framework is how Eclipse Ventures quantifies every investment's future carbon reduction potential, increasing our confidence that our portfolio companies can help accelerate the divergence between economic growth and the decline in carbon emissions.

**FIGURE 5**  
**THE INDUSTRIAL EVOLUTION CAUSES GDP & EMISSIONS GROWTH TO DIVERGE**



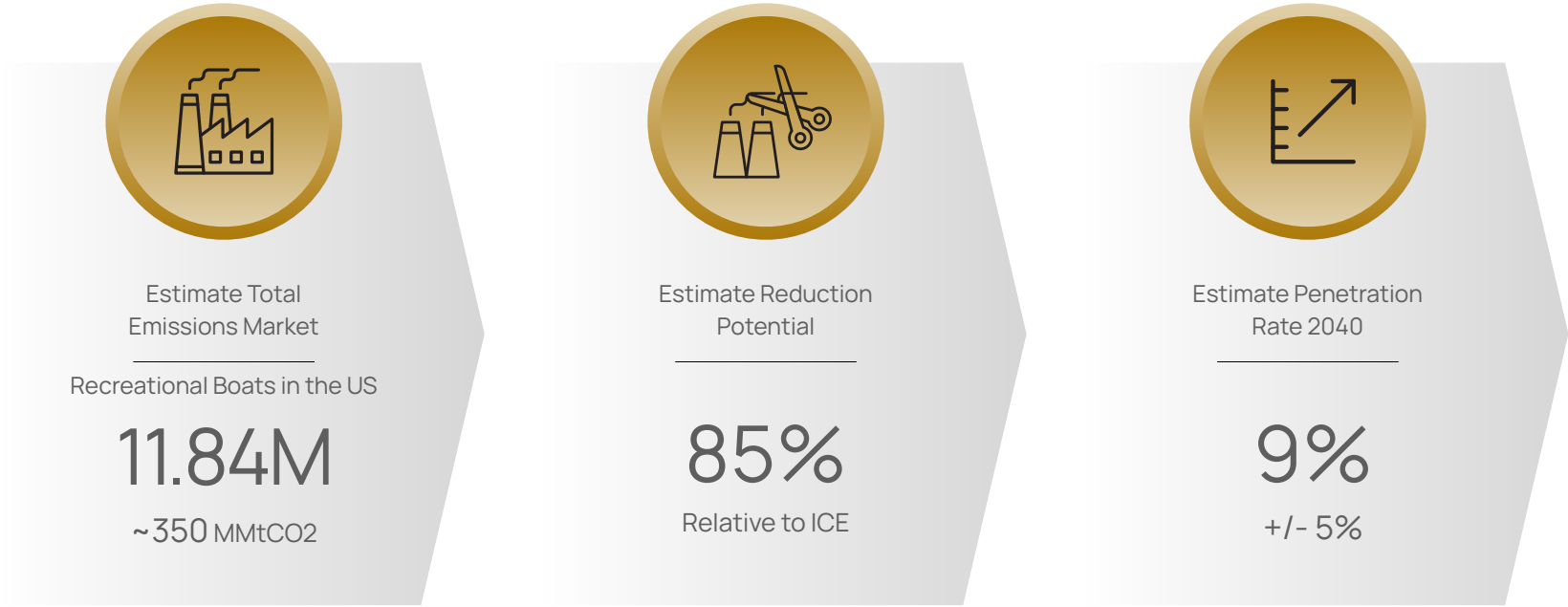
Source: Rho Impact



The Industrial Evolution will transform our physical global economy into a more efficient, resilient, and sustainable system. As our global economy experiences the Industrial Evolution, the underlying carbon intensity of our physical industries will decline, reducing carbon intensity by more than 90% and enable

the world to achieve net-zero carbon emissions by 2050 (See Figure 6). Without dramatic changes to our physical infrastructure driven by emerging technologies, we will never reach net-zero.

FIGURE 6  
HOW THE ECO FRAMEWORK WORKS → ARC BOATS



Market Size 350 MMtCO2 × Reduction Potential 85% × Penetration 9% = Arc Boats Reduction Potential 27 MMtCO2 Annually





## HIGHLIGHTED MARKETS AND REDUCTION POTENTIAL

**Physical industries are responsible for three-quarters of global greenhouse gas (GHG) emissions.**

Among the sectors contributing a significant amount of carbon emissions worldwide are industry, manufacturing, and transportation. Industry/Manufacturing represents around 24% of global carbon emissions. The overwhelming majority of the carbon intensity comes from energy and waste. Eclipse Ventures portfolio companies focus on enabling increased efficiency through higher yield, more productive assets, and ultimately, far lower energy intensity per unit of production. Some of the companies addressing the carbon intensity of the physical world include Bright Machines, Augury, and Arc.

## HIGHLIGHTED MARKET

## REDUCTION POTENTIAL



Bright Machines' intelligent assembly automation solution helps manufacturers reduce material waste, scrap, and rework, while improving energy efficiency and space utilization. Electronics assembly / manufacturing is a massive industry that is carbon-intensive, emitting 382.4 MMtCO<sub>2</sub> annually.

Due to improved yield and efficiency, Bright Machines reduces per unit carbon intensity by ~50% and has the potential to reduce more than 5 MMtCO<sub>2</sub> annually by 2040.



Augury has pioneered 'machine health,' a physical and digital service that monitors machinery, improving uptime, extending asset life, and improving energy efficiency. Rotary equipment in manufacturing emits ~48.9 MMtCO<sub>2</sub> annually.

Due to higher uptime, more efficient energy use, and higher yield, Augury cuts emissions by ~12%, resulting in 3 MMtCO<sub>2</sub> reduced annually by 2040.



Arc is electrifying recreational boats. The company has developed the first purpose-built maritime design to house a >200kwh battery pack for optimal maritime performance. Recreational boats emit ~350 MMtCO<sub>2</sub> annually in the United States alone.

Through electrification Arc reduces emissions compared to ICE boats by 85%. Assuming 25% market penetration by 2040, Arc has the potential to reduce emissions by 27 MMtCO<sub>2</sub> annually by 2040.



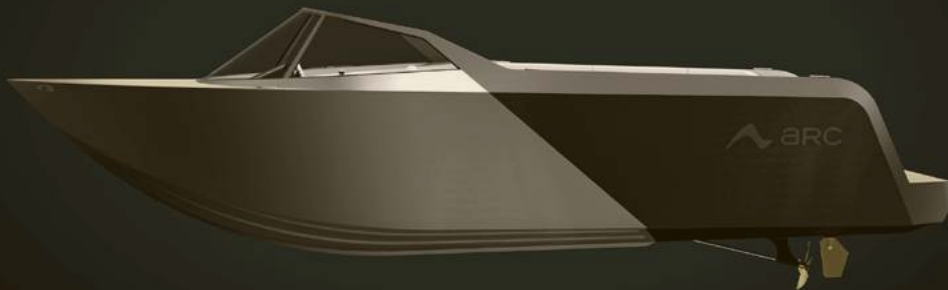


Transportation represents 16% of global carbon emissions and more than 27% of U.S. emissions. Among our portfolio companies addressing the carbon intensity of the transportation market are:

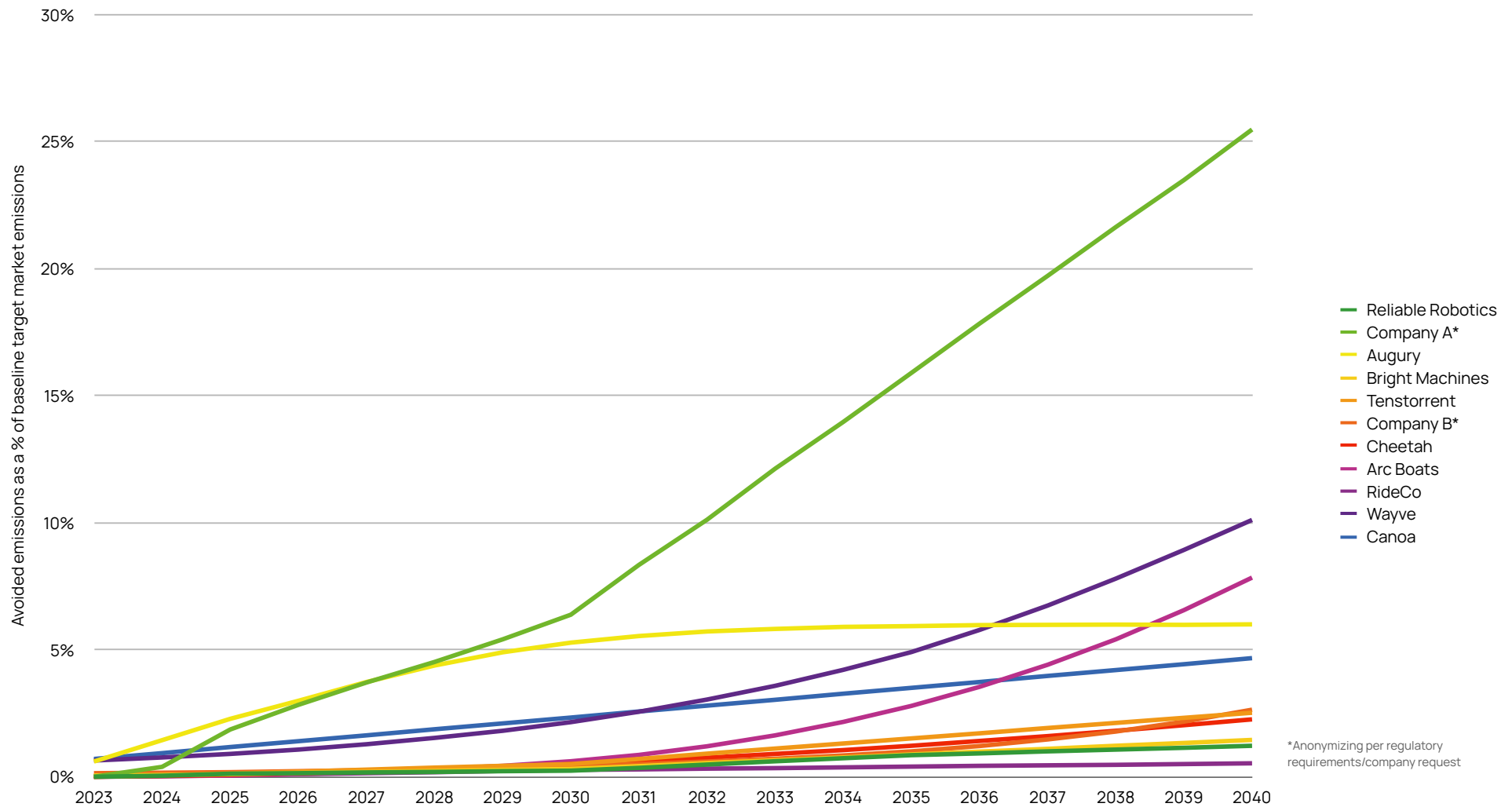
**RideCo** improves utilization of public transportation through dynamic routing, improving ridership, while also reducing individual passenger vehicle usage. Individual passenger emissions is a 1309 MMtCO<sub>2</sub> market, annually. RideCo reduces carbon emissions by ~53% on a LFL basis, and is expected to reduce ~6.9 MMtCO<sub>2</sub> annually by 2040.

**Company B** uses a novel battery architecture to improve the density and energy efficiency of lithium-ion cells, decreasing cost and footprint which accelerates the adoption of electrification. With time, the company will grow into electric vehicles, replacing internal combustion engines, a 600 MMtCO<sub>2</sub> market in 2040 (shrinking due to existing electrification). Assuming 8% market penetration Company B has the potential to reduce emissions by ~16 MMtCO<sub>2</sub> annually.

Adopting a similar approach to Tesla, **Arc Boats** is creating a new class of electrified boats, initially with high-performance watersport boats and later expanding into the recreational boat mass market. By 2040, recreational boats are expected to emit 350 MMtCO<sub>2</sub> annually. Assuming less than 10% market penetration, Arc has the potential to reduce emissions by more than 27 MMtCO<sub>2</sub> annually.



## REDUCTION RELATIVE TO TARGET MARKET EMISSIONS







## ECO PROFILES: ANALYSIS OF COMPANY-SPECIFIC POTENTIAL



Powered by **CRANE** 

### Company Description

Arc Boats is taking a similar approach to Tesla to electrify the marine market, beginning with high-end performance boats, and then shifting to mass-scale entry-level production.

### Market Description

The US recreational boating market is expected to emit ~350 MMtCO<sub>2</sub> annually in 2040.

**That is equivalent to 5% of the total US emissions today.**

### Problem

Recreational boating is a large market, with >400,000 boats sold annually in the U.S. Due to high drag (from water), boats are incredibly energy intensive, often getting <1 mpg. Besides Arc, there are no other viable solutions to electrify the market.

### Summary

Arc has developed the first purpose-built maritime design to house a >200kwh battery pack for optimal maritime performance. The company's product is currently on the water and will be in market by H1 2023. Because there are no viable electric solutions today, Arc is replacing a fossil fuel alternative and will reduce the carbon intensity of the recreational boating industry by 85%, resulting in 27 MMtCO<sub>2</sub> in emissions reduction by 2040, assuming 9% market penetration.



85% Reduction potential  
or 27 MMtCO<sub>2</sub>  
annually, or the  
emissions from

**4.1M**  
homes

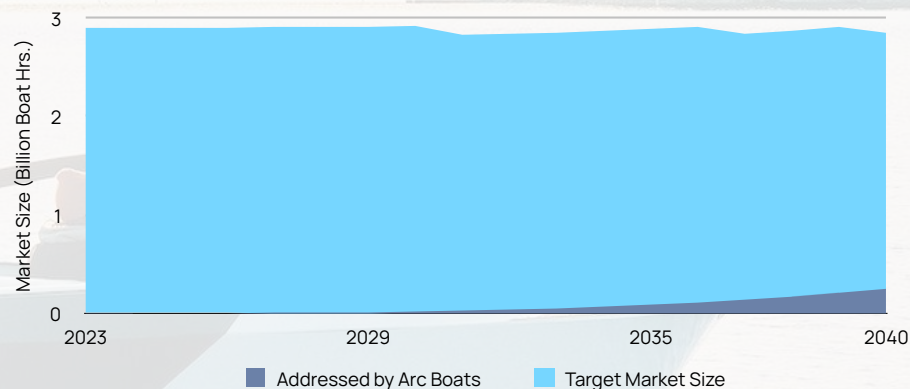
### Positive Impact on the Industrial Evolution

Arc offers the first high-performance solution to electrify the recreational boating market. Arc's approach will enable the electrification of an entire emissions-intensive industry, while also providing a superior customer experience to today's boats.

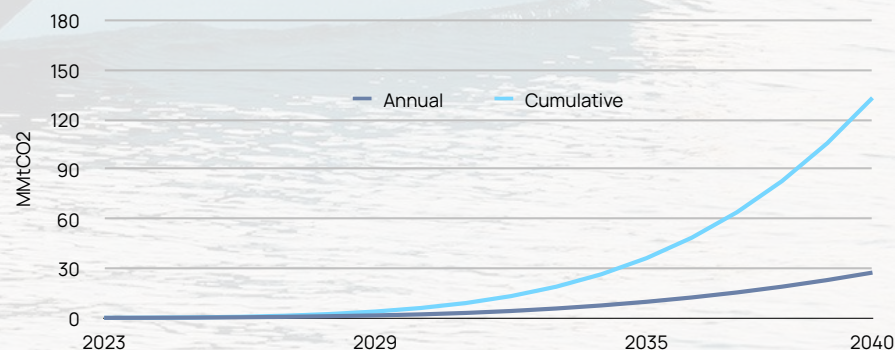
### Assumptions

We assume that Arc only disrupts the recreational boating market and do not currently assume ferries, ships and inland transport, but will reassess each year as the company has this in its roadmap.

### Total Recreational Marine Emissions Market Size (ERP)



### Arc Boats Emissions Reduction Potential (ERP)







Powered by **CRANE** 

### Company Description

Augury has deployed IoT across industrial applications combined with software to digitize the industrial world providing real time machine health analysis and predictive maintenance. Improving uptime, extending asset life, and increasing energy efficiency.

### Market Description

Manufacturing rotary equipment is expected to emit 48.9 MMtCO<sub>2</sub> annually in 2040.

**That is equivalent to ~0.8% of total US emissions today.**

### Problem

Our industrial footprint is built on top of rotary equipment, which runs inefficiently and unexpectedly breaks down. Diagnostics is challenging and most factories lack the tools to perform preventive maintenance resulting in unplanned downtime, higher energy costs, and shorter asset life.

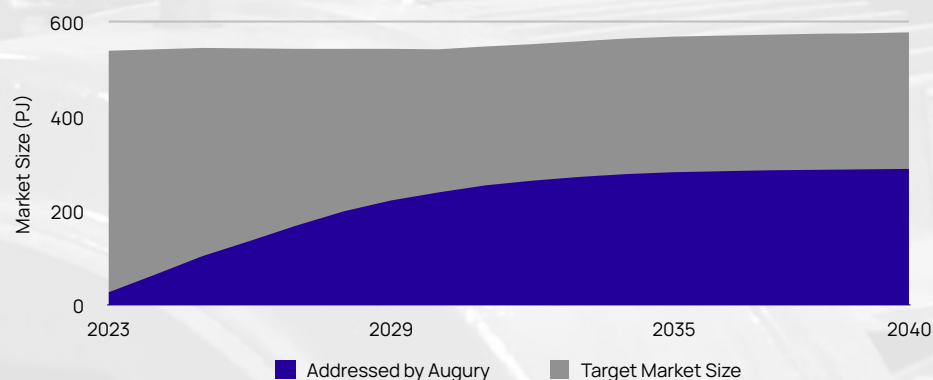
### Assumptions

We assume Augury is only in manufacturing rotary equipment, however the company is already deploying into the energy and utility sector, expanding its scope of impact. Further, we do not assume any emissions reductions from the elimination of product waste during manufacturing downtime. We will make adjustments based on Augury's progress in the next report.

### Summary

Augury deploys its platform across manufacturing rotary equipment. Augury's Software + IoT devices monitor equipment for inefficient operations and potential unexpected downtime. Augury's machine health / APM platform results in less unplanned downtime, more efficient operations, and longer asset life. As a result, Augury reduces emissions from rotary equipment by ~12%. Rotary equipment tends to make up ~25% of carbon emissions in manufacturing, a ~50 MMtCO<sub>2</sub> market in the developed world. We expect Augury to reach 6% penetration by 2040. The total market size is conservative given Augury has far wider applications, so our ~3 MMtCO<sub>2</sub> annual reduction potential in 2040 is achievable.

### Manufacturing Energy Consumption by Rotors, USA



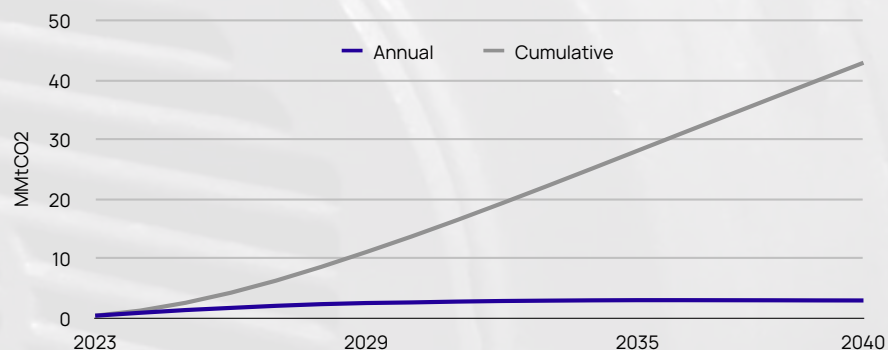
**12% Reduction potential**  
or 3 MMtCO<sub>2</sub>  
annually, or the  
equivalent of

**750K**  
gas powered cars

### Positive Impact on the Industrial Evolution

Augury is digitizing the manufacturing footprint, allowing managers to see how their equipment is performing in real time. Plants will run more efficiently, requiring less energy and a smaller footprint. Together Augury improves supply chain and manufacturing resiliency, bringing the industrial world into the digital age.

### Augury Emissions Reduction Potential (ERP)





Powered by **CRANE** 

### Company Description

Bright Machines is rethinking manufacturing with intelligent, software-defined microfactories for electronics assembly. Automation helps the industry achieve higher yields, decrease waste, and reduces global transportation requirements.

### Market Description

The electronics assembly market is expected to be ~380 MMtCO<sub>2</sub> by 2040.

**That is equivalent to ~1% of the total US emissions today.**

### Problem

Today, many electronics are manufactured in low-cost countries and assembled by manual labor. This can create a high degree of inefficiency in supply chains – from sizable scrap rates due to human error, to finished goods getting stranded offshore.

### Summary

Bright Machines is a technology company that is pioneering an innovative approach to intelligent, full-stack manufacturing. This means not only is it feasible to move factory operations closer to home, but it's also economically and environmentally advantageous over the long run. The company's solutions can reduce the GHG intensity of electronics manufacturing by ~51%, resulting in an annual reduction potential of 5.5 MMtCO<sub>2</sub> by 2040, equivalent to planting 6.5mm trees yearly.



### Positive Impact on the Industrial Evolution

The truth is that factories have not evolved along with the products they make. By delivering a flexible and scalable full-stack automation solution, Bright Machines is helping to modernize one of the world's biggest industries – enabling companies to localize supply chains, increase productivity, and reduce costs.

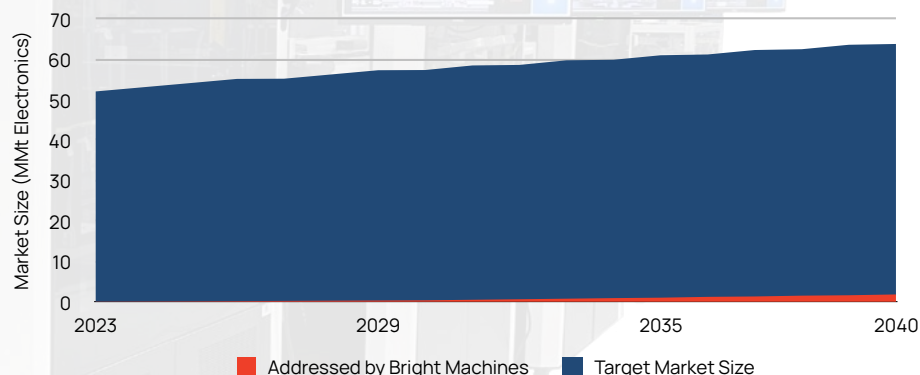
**51% Reduction potential**  
or 5.5 MMtCO<sub>2</sub> annually or equivalent to planting

**6.5M**  
trees annually

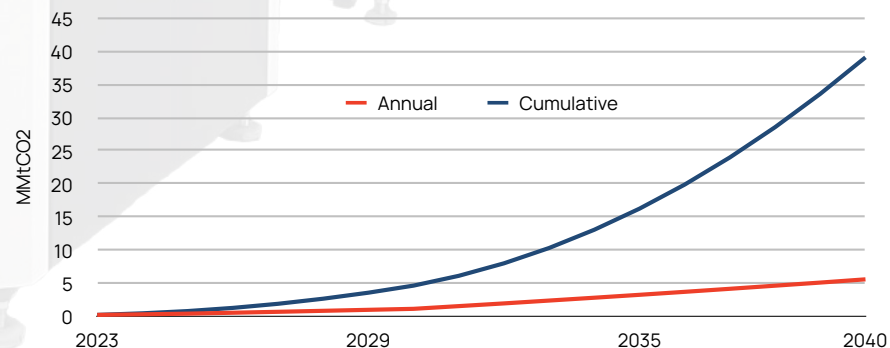
### Assumptions

These results are based on Bright Machines' current focus on electronics assembly automation and do not take into consideration future expansion into other categories. Additional emissions reductions benefits related to re/near-shoring of manufacturing (e.g. eliminating international freight) were not included in the calculations.

### Production of Consumer Electronics, Global



### Bright Machines Emissions Reduction Potential (ERP)







Powered by **CRANE** 

### Company Description

Canoa is digitizing the internal footprint of commercial real estate, enabling reusable / modular office designs, and eliminating the waste of office renovations by recycling and offering reusable furniture and designs.

### Market Description

The internal commercial real estate market is expected to emit ~430 MMtCO<sub>2</sub> market annually in 2040.

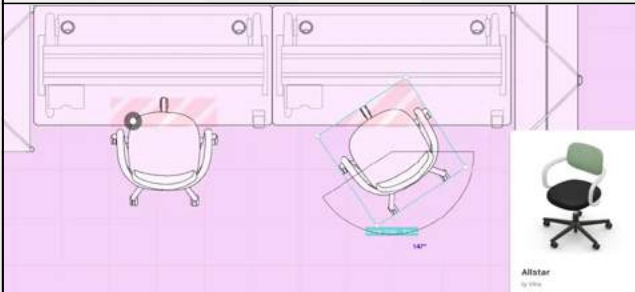
**That is equivalent to ~5% of the total US emissions today.**

### Problem

Commercial office space is renovated every five years. Over the lifetime of a building, renovations, including new furnishings will emit >5x more emissions than building construction along with tremendous economic costs. This is both economically and environmentally inefficient.

### Summary

Canoa allows companies to digitally render their office footprint, design new spaces with highly modular and recyclable designs / furniture, which eliminate the need for full renovations. Instead, offices can be redesigned without the need for construction, new flooring, and new furniture based on the needs of the tenant. This increases flexibility and saves customers money, while also reducing total emissions relative to full renovations by ~93%. We assume 5% market penetration in the U.S. for Canoa by 2040, which results in 20 MMtCO<sub>2</sub> reduction annually.



### Positive Impact on the Industrial Evolution

Construction is a large emissions contributor (>10%) and the industry has not evolved for centuries. Canoa is creating a platform that enables what was historically one of the most inflexible physical industries, commercial real estate, to become modular and adaptable without the heavy economic and environmental costs for renovation.

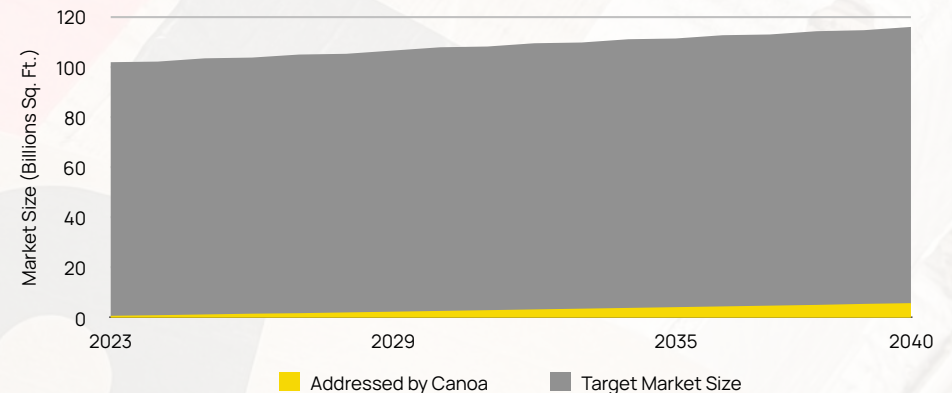
**~93% Reduction potential**  
or 20 MMtCO<sub>2</sub> annually or

**~5M**  
gas powered cars

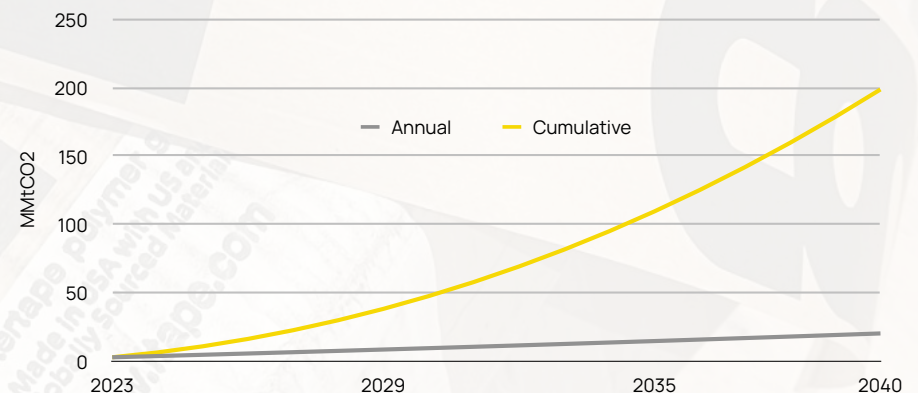
### Assumptions

We assume that Canoa only operates in the US market (5% penetration).

### Commercial Floor Space, USA



### Canoa Emissions Reduction Potential (ERP)







Powered by **CRANE** 

### Company Description

Cheetah is a tech-enabled B2B food distribution marketplace for local and sustainable wholesale foodservice supplies.

### Market Description

Food supply chains are expected to emit ~550 MMtCO<sub>2</sub> annually in the US by 2040.

**That is equivalent to ~8% of the total US emissions today.**

### Problem

Food supply chains are inefficient and outdated. Legacy distributors create poor customer selection, substantial waste, and inefficient logistics networks, increasing costs and emissions.

### Summary

Cheetah designed its tech-enabled distribution network with modern customer demands in mind, creating a distributor for locally grown food and a tech stack that dramatically reduces the efficiency of delivery and inventory. More efficient routing enables lower emissions per delivery, while better inventory and local supply chains reduce waste. With its new approach, Cheetah reduces emissions compared to legacy distributors by 9.5% and is estimated to reduce relative emissions by 12 MMtCO<sub>2</sub> annually by 2040.



### Positive Impact on the Industrial Evolution

Our food supply chains are critical to improving the well-being of the population. Legacy networks rely on fragile global networks, but Cheetah's approach focuses on localization and reduction of "food miles" while also lowering costs, creating a more resilient supply chain.

9.5% Reduction  
potential  
or 12 MMtCO<sub>2</sub>  
annually or

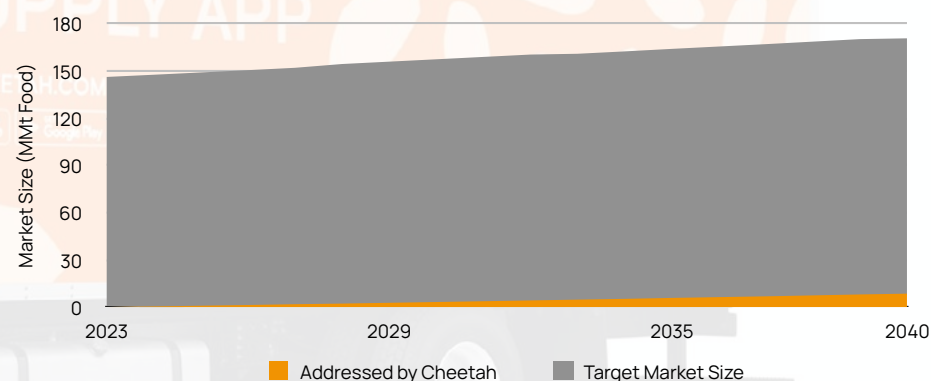
**29.7B**

miles driven by  
passenger cars

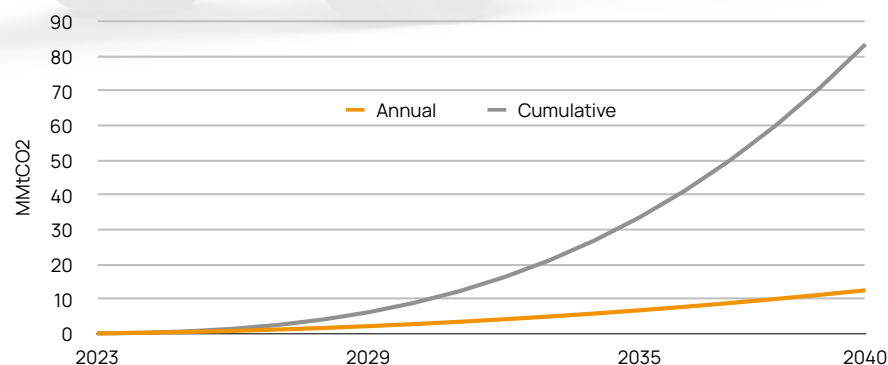
### Assumptions

We assume Cheetah is successful with its "Inventory as a Service" initiatives by reducing inventory from both their customers and from Cheetah operations. We also take into account local agriculture and new food sources. We do not include the potential to nudge customers to plant-based alt meats, although this is part of Cheetah's roadmap. We will re-evaluate as these services evolve.

### Total Food Service Human Food Supply, USA



### Cheetah Emissions Reduction Potential (ERP)





Powered by **CRANE** 

### Company Description

Reliable Robotics is developing a remotely operated autonomous aircraft system to automate all phases of flight, including taxi, takeoff and landing. This system will greatly improve pilot productivity, improving the economic viability of regional 'feeder' cargo operations and enabling cargo operators to flexibly deploy aircraft on point-to-point routes across the network of 5,000+ existing public-use airports in the U.S. to meet customer demand.

### Market Description

Rural freight is expected to be a ~90 MMtCO<sub>2</sub> market annually by 2040.

**That is equivalent to ~1% of the total US emissions today.**

### Problem

Aircraft operators currently fly a limited set of fixed routes on inflexible schedules, which limits their ability to adapt to changing demand patterns. As a result, aircraft are underutilized – both in terms of flight hours and unused capacity – and pilot productivity remains low, particularly for small 'feeder' cargo aircraft.

### Summary

There are over 5,000 public-use airports in the U.S., but only ~10% are typically utilized for commercial transport. Small cargo aircraft are the most environmentally efficient freight modality if they can travel point-to-point, with higher utilization. However, the pilot tends to represent >50% of the cost for cargo planes, making air freight economically inefficient in existing operations. Reliable's remotely piloted aircraft system will greatly improve pilot productivity, decreasing operating costs and increasing freight capacity by 40%, while reducing per-package emissions intensity by ~30%. As a result, airlines can economically operate new point-to-point cargo routes with small aircraft and improve the cost and environmental efficiency of their entire operation.



### Positive Impact on the Industrial Evolution

Over 20% of the U.S. population lives in rural areas. Our logistics networks need more efficient and faster modalities to connect with 1/3 of America. Enabling economical point-to-point air cargo operations will increase the utility of the existing air cargo network.

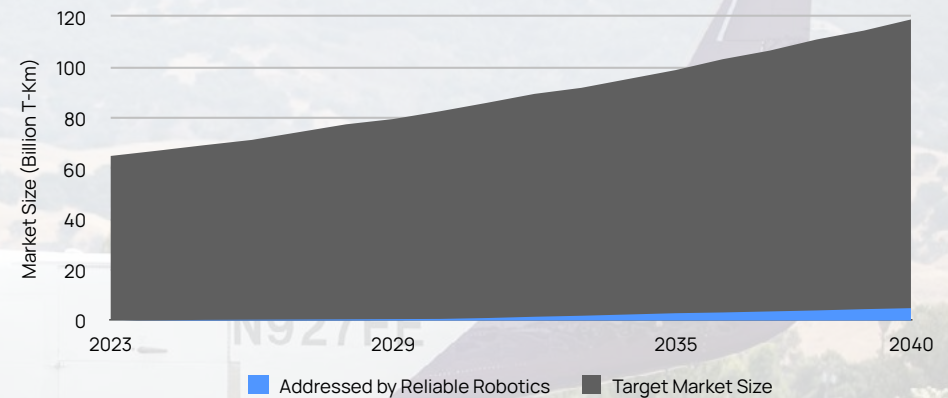
~30% Reduction  
potential  
or 1.1 MMtCO<sub>2</sub>  
annually, or

**1.2B**  
pounds of coal

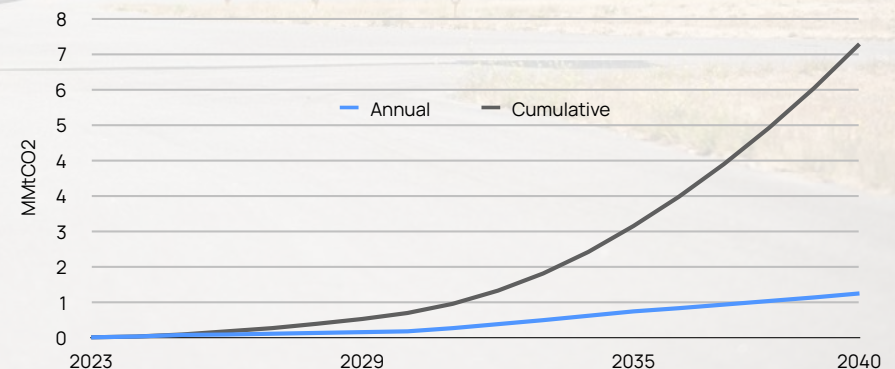
### Assumptions

We assume that Reliable improves the efficiency of rural logistics, specifically the mid-mile segment that is currently transported over the road.

### Rural Air Freight, USA



### Reliable Robotics Emissions Reduction Potential (ERP)







Powered by **CRANE** 

### Company Description

RideCo is redefining public transportation by partnering with municipal transport infrastructure and enabling dynamic routing, on-demand transit solutions. RideCo provides the convenience of ride hailing with the efficiency of public transportation and expands access to public transport in under-served neighborhoods across North America.

### Market Description

Light and heavy duty road vehicles in the US & EU are expected to emit ~1,310 MMtCO<sub>2</sub> annually by 2040.

**That is equivalent to 15% of the total US emissions today.**

### Problem

Public transportation is one of the most elegant ways to quickly reduce transportation emissions from passenger vehicles. However, the inconvenience prohibits ridership. Further, static routes, result in low utilization. Public transport networks lack the tools / software to drive higher utilization and improve rider experience.

### Summary

RideCo is enabling municipal transport networks to offer Uber like customer experiences at a "bus fare" price point. A rider can request that a smaller public vehicle picks them up near their home and brings them along with other riders to a public transportation hub, providing access to public transportation to large metro areas that are currently underserved. Rho estimates RideCo can reduce carbon emissions by 53% per passenger mile by shifting commuters from passenger cars to public transit. Assuming only 1% market penetration, RideCo can reduce ~7 MMtCO<sub>2</sub>, annually by 2040.



### Positive Impact on the Industrial Evolution

Dynamic route, on-demand transit enabled by RideCo will improve mobility in a community by reducing waiting/walking times and the total journey time. Improving access to quality transit will connect individuals to more employment centers, schools/colleges, and to recreation/retail centers. This in turn will foster further economic development and human development in the community.

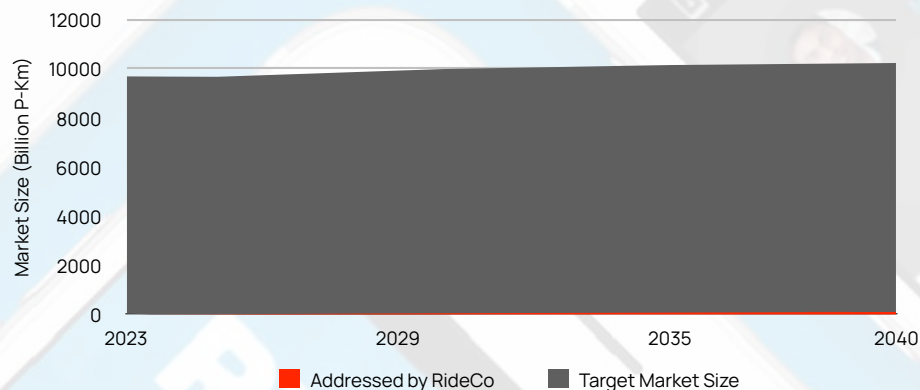
**53% Reduction potential**  
or ~7 MMtCO<sub>2</sub> annually, or

**1.5M**  
ICE passenger cars annually

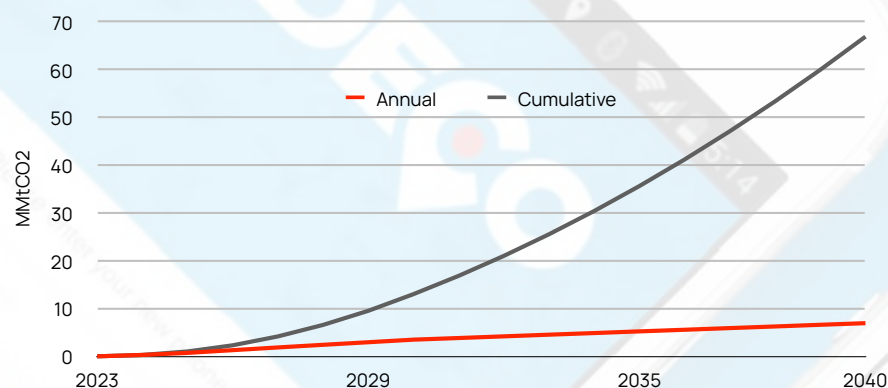
### Assumptions

We assume that RideCo expands to the majority of tier 1 and tier 2 cities in the United States and ultimately transfers 1% of total US passenger miles traveled via ICE to public transportation. We also assume that 50% of all passenger vehicles will be electric by 2040, reducing the addressable emissions market with time.

### Passenger Travel, Light and Heavy Road Vehicles, EU and USA



### RideCo Emissions Reduction Potential (ERP)







tenstorrent

Powered by CRANE 

### Company Description

Tenstorrent is developing purpose-built silicon designed to accelerate artificial intelligence processes. Purpose-built chips enable 8x higher performance than the leading incumbent AI GPUs with 2x higher performance and 25% of the power requirements.

### Market Description

Data centers emit ~391 MMtCO<sub>2</sub> annually and the emissions profile is expected to grow since every global industry is increasingly dependent on technology.

**That is equivalent to ~5.5% of the total US emissions today.**

### Problem

The amount of data produced doubles every three months, resulting in a 256x increase in data every two years. Compute efficiency to process that data, specifically in AI applications, following Moore's Law, only doubles each year. Underlying demand for silicon to process the exponential growth in data is driving a dramatic increase in data center growth. Compute power is incredibly energy intensive and is one of the fastest growing components of global emissions.

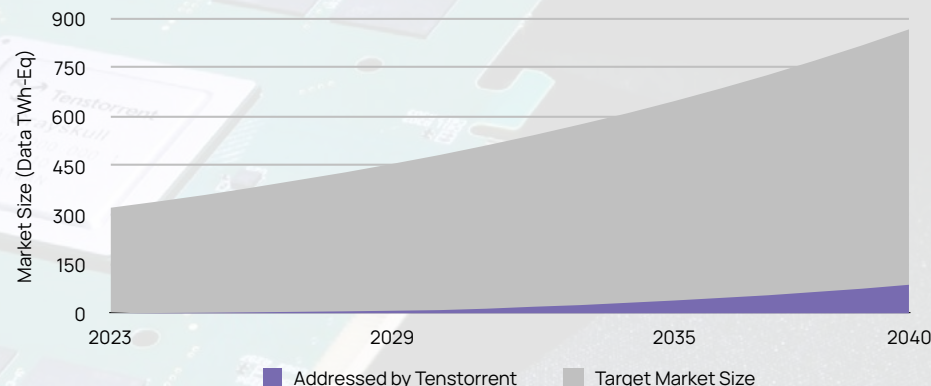
### Summary

Through its superior processing and energy efficiency, Tenstorrent systems only require 12% of the energy needed by a comparable Nvidia system for the same amount of compute. As a result, Tenstorrent reduces the carbon intensity of compute by ~25%. Assuming 10% global market penetration of Tenstorrent by 2040, ECO estimates Tenstorrent can reduce total carbon emissions by ~10 MMtCO<sub>2</sub> annually by 2040.

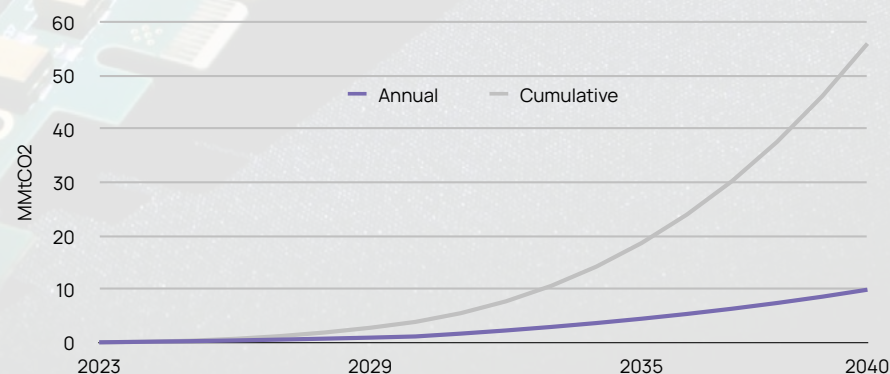
### Assumptions

We assume that Tenstorrent will sustain its energy saving and tech advantage through new chip releases while also reaching 10% of the global data center market. We don't assume other markets.

### Data Center IT-Only Demand, Global



### Tenstorrent Emissions Reduction Potential (ERP)



### Positive Impact on the Industrial Evolution

With the proliferation of AI across all industries, efficient purpose-built GPUs and CPUs are essential for cheaper and more energy-efficient processing. Innovations in silicon will transform data centers and the compute infrastructure into sustainable technologies for the Age of AI.

25% Reduction potential  
or ~10 MMtCO<sub>2</sub> annually, or the offset from

**400M**  
trees



Powered by **CRANE** 

### Company Description

Wayve has developed a differentiated end-to-end deep learning platform that will enable autonomous driving to scale globally, with a high degree of capital efficiency. The Wayve platform is purpose-built for electric vehicles.

### Market Description

Light and heavy duty ICE vehicles are expected to emit ~1,000 MMtCO<sub>2</sub> annually by 2040.

**That is equivalent to 15% of the total US emissions today.**

### Problem

Internal combustion engines combined with human drivers are incredibly inefficient. Transportation contributes 29% of U.S. GHG emissions, commercial drivers account for ~50% of costs, and the average person wastes 250 hours in transit each year.

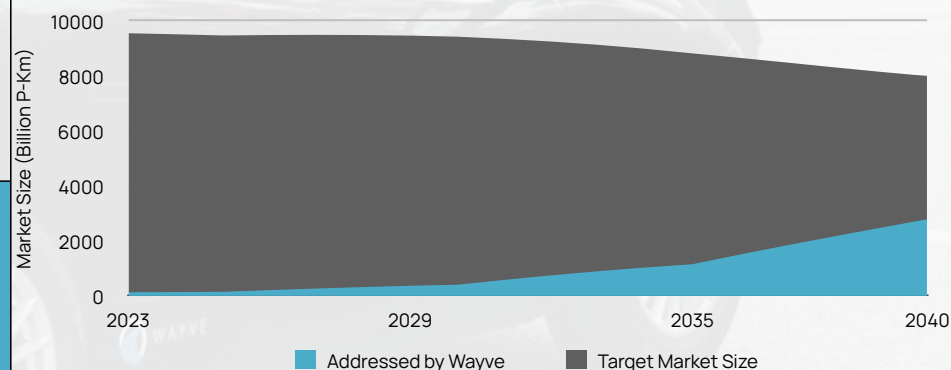
### Assumptions

We assume that future autonomous vehicles will reduce emissions by 48.6% relative to conventional ICE vehicles. We were unable to quantify the amount of vehicles reduced through fleets/increased utilization and therefore did not include this in our calculation. Wayve also plans to only use electric vehicles, but we did not include this impact.

### Summary

Wayve is solving multiple problems with its capital-efficient and highly scalable autonomous driving platform. On top of productivity and cost savings, autonomous vehicles drive more efficiently (-9% reduction). As a result, Wayve will reduce carbon emissions by ~10% relative to existing light vehicle assumptions. We assume 20% penetration of Wayve's technology by 2040.

### Passenger Travel, Light and Heavy ICE Vehicles, EU and USA



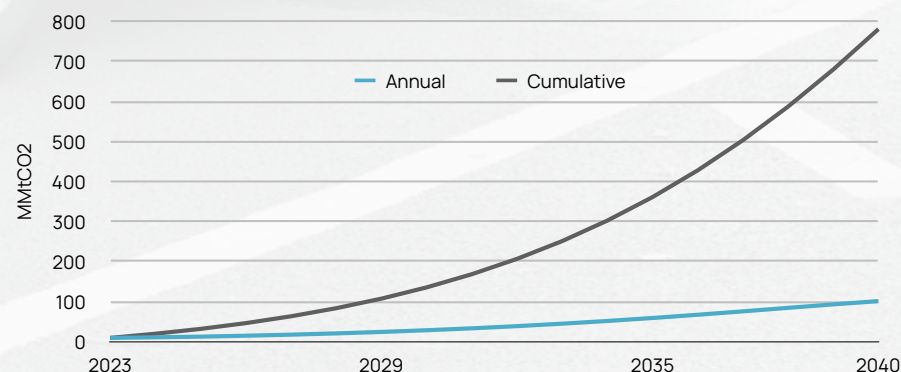
~10% Reduction potential  
or 101 MMtCO<sub>2</sub> annually, or the equivalent of

**27K**  
wind turbines

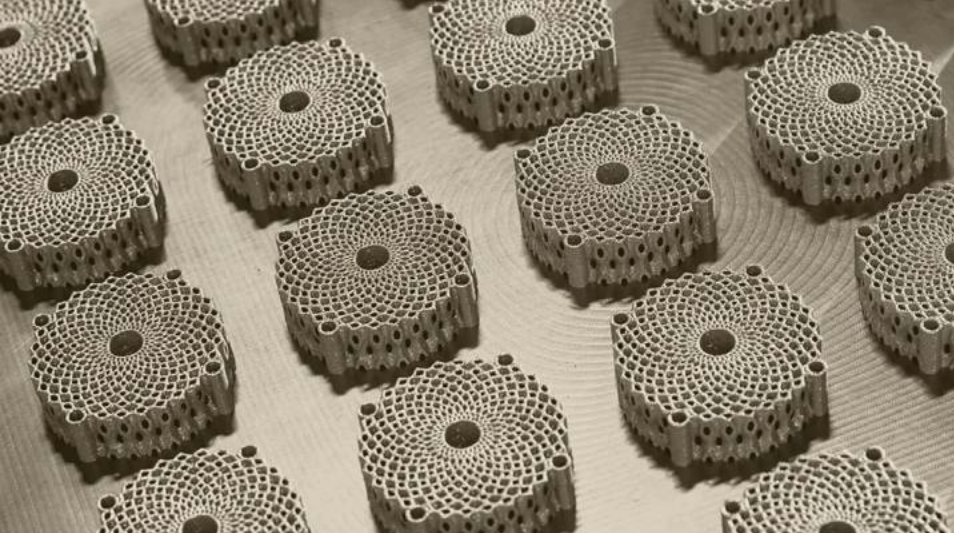
### Positive Impact on the Industrial Evolution

Autonomous vehicles are one of the major technological challenges of this century. If successful, AVs will unlock a wave of productivity comparable to the internet. They will also dramatically reduce traffic and decrease Individual vehicle ownership.

### Wayve Emissions Reduction Potential (ERP)







## CONCLUSION

Our vision at Eclipse Ventures is a world transformed by the Industrial Evolution, led by innovative tech companies focused on digitizing physical infrastructure. With our ECO Framework, we are able to dynamically assess a technology's economic value potential and its environmental value potential, both now and 10 to 20 years into the future. Our goal is to reveal the true promise and impact of that technology in order to build and increase investor and public confidence in companies transforming physical industries. Our estimations confirm that dramatic increases in efficiency and resiliency will be accompanied by high sustainability benefits. We are championing the need for and the importance of quantifying future sustainability for emerging technologies. We anticipate that our portfolio investments can help to accelerate the divergence between economic growth and the decline in GHG emissions, and ultimately, improve the lives of everyone around the world and the health of our planet.

If you would like to learn more, or dive deeper into our methodology, please reach out to Eclipse Partner and Lead Author of the report, Jay Knafel: [jay@eclipse.vc](mailto:jay@eclipse.vc). We're happy to walk you through a thorough process review, explanations of CRANE and other methodologies, and/or are happy to share individual CRANE reports, which contain more detailed explanations for individual company assessments.





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