



ATLAS IMPACT PARTNERS

2022 Impact Report

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January 5, 2023

Dear Impact Investing Community,

We are again very pleased to be writing to you with our annual impact report. We hope this letter finds you healthy and well.

As we turn toward the new year, and as the world continues to evolve in the post-pandemic period, we reflect on two significant developments affecting the global economy and global population. On the positive side, in many areas, we see a clear, viable, and powerful trend toward a more sustainable economy. While we acknowledge there are significant challenges and much work to be done ahead, the momentum is evident and gaining. As investors, we see the trends in both corporate behavior and in investors' actions, as well as through regulatory support. For corporations and consumers, alternative energy is no longer an alternative, it is mainstream. Transportation is increasingly independent from carbon-based power, and a circular economy has taken shape.

For many of these issues, regulatory support is evident: from the European implementation of the SFDR framework and the recent SEC proposed rule regarding ESG disclosure, to legislative support through the Inflation Reduction Act. All these trends support the thesis underpinning one of the central themes of our impact framework; that companies providing solutions which drive toward a more sustainable world have the highest impact and will continue to thrive and profit.

At the same time, on a personal, human level, we also see an unsettling trend toward less sustainable lifestyles, affecting consumers' health and financial well-being. The most prominent impact is the surge in availability of products and services dependent on repetitive, sometimes addictive consumption. We see this in unhealthy food products and services, processed and prepared in ways that promote excessive consumption. We also see evidence of growing trends toward proven addictive behaviors, such as tobacco consumption and gambling. And there is an equally alarming trend toward the promotion of cognitive addiction, through social media outlets and streaming services, which can have devastating emotional and economic effects. All these issues are promoted by products and services which are sold by companies with a perverse incentive – to raise revenue through excess consumption and addictive behaviors.

As we reflect on a period which we believe will be seen as an inflection point– in terms of Covid recovery and energy transition in particular – we are increasingly certain that investing in public companies is the most important means of directing capital to innovative solutions for many of the world's pressing issues, and certainly that is our focus. As we have said previously, the scale required to advance the adoption of alternative energy, implement circular economies, and resolve healthcare challenges requires large amounts of capital. Conversely, we believe that reducing human dependence on unhealthy habits means elevating the cost of capital for companies producing the products and services which create and depend on those habits.

Careful readers of our letters will note our focus in this year's report tends toward issues related to personal behaviors and companies that either manipulate them or promote them. We believe these are areas that are sometimes overlooked in the world of impact investing, and in our opinion, deserve attention. We note that although we do not focus in this note on all of our impact themes, such as healthy

and productive living and financial equality, we remain dedicated to those issues, which we also write about throughout the year.

We will close by reminding our readers that this impact thesis is the foundation of our firm. As we discuss in the pages ahead, our process begins by identifying a universe of companies which we assess for impact through an empirical analysis of the outputs and outcomes created by the products and services generating revenue for each company. Our examination leads us to a cohort of companies in Developed Europe and North America that generate a high degree of impact, either positive or negative. We then generate impact metrics for these companies.

Thus, with this self-imposed standard of impact in mind we offer our annual impact report every year. We do so with two objectives. First, we are passionate about impact investing and hope that our work will create a robust platform for proving that investing in impact is a productive allocation of capital. Second, we are empiricists and hold ourselves to a high standard when measuring impact. As investment professionals dedicated to an impact mission and as conscious stewards of capital entrusted to us, we believe that transparency is a mandatory commitment upon which we build our fellow impact investors' trust and to which we hold ourselves accountable.

All our best,

The Atlas Impact Team

The Atlas Impact Definition of Impact Investing

Impact investing can create honest debate and passionate disagreement: an issue which is critical in the eyes of one stakeholder may be secondary to another equally authentic and motivated stakeholder. A foundation seeking to alleviate income inequality by providing small business owners with access to capital may have a reasonable debate over the importance of this with an investor seeking to support vulnerable members of the same communities by addressing hard to treat diseases. A family dedicated to promoting environmental solutions may debate equally compelling choices between the effectiveness of cutting carbon emissions through electric vehicle transportation and geothermal energy production.

At Atlas, we do not endeavor to make these relative judgments; rather we align our impact mission with widely understood and increasingly accepted global standards for impact assessment which lead us to six thematic areas which are, in our opinion, significant global challenges. Once we believe a company is aligned with our thematic framework, we develop metrics to measure the impact of the product or service sold by each company. Thus, in our eyes, impact is not generally a relative assessment, it is a binary one: a company's product or service either meets our rigorous standards or it does not.

We believe this approach directly supports our mandate three ways: first, a clearly articulated framework keeps us accountable to a mission-aligned standard across all companies; second, the discipline of identifying rigorous impact metrics assures an authentic articulation of these standards; third, an empirical metric prevents "mission creep" as companies inevitably evolve. In other words, for every company, we understand how it fits our impact thesis and endeavor to estimate the impact its product or service generates. While we do not claim to have created "the" definition of impact investing, we believe we are managing a genuine impact framework, and one which is consistent with the UN PRI and industry standard-bearers such as The Impact Management Project.

To be sure, we also believe this process drives significant investment benefit. As investors with a long view of systemic challenges and solutions, we consistently seek to look through the current trend to a full cycle. Beginning with an impact mandate allows us to innately lengthen the time horizon for our fundamental valuation assessment and investment return. Additionally, a constrained set of companies focuses our resources and our analyses, generating a deeper understanding of the issues which drive each company's valuation. We believe these constraints lead to focus, clarity, and ultimately better investment decisions.

Atlas Impact Thematic Areas of Impact

Atlas Impact Theme

Aligned SDGs

Enabling Environmental Solutions

- Sustainable Energy and Transportation
- Clean Water Technologies
- Avoiding Environmental Damage

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Creating a Sustainable Food System

- Sustainable Food Production
- Healthy Food Products and Services
- Clean, Transparent Supply Chains

.....



Modernizing Capital and Industrial Infrastructure

- Clean Building Materials
- Specific End User Targeted Real Estate Development
- Building Efficiency

.....



Unique Solutions for Healthy and Productive Living

- Precision Diagnostics, Medicines, and Devices
- Access to Medicine and Medical Care
- Addressing Healthcare Disparities and Unmet Needs

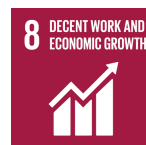
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Harnessing Beneficial Digitization

- Protecting Consumer Privacy
- Purposeful Content
- Closing the Education Gap
- Reducing Waste

.....



Financial Services as a Force for Good

- Under-served Credit Markets
- Promotion of Financial Equity
- Global Money Flow Transparency
- Access to Safe and Affordable Housing

.....



Aligned SDGs include, but are not limited to, those listed for each Atlas Impact Theme

Atlas Impact Thematic Areas of Impact

Examples of Thematic Products & Services

Positive Impact | Negative Impact

Enabling Environmental Solutions

- Solar and wind systems
- Train and railway components
- Electric vehicles and charging infrastructure
- Water engineering
- Diesel and internal combustion engines
- Oilfield services
- Coal extraction

Modernizing Capital and Industrial Infrastructure

- Low-cost, efficient insulation materials
- Testing and verification
- Life science and agriculture research facilities
- Unsustainable chemicals production
- Environmentally harmful materials

Harnessing Beneficial Digitization

- Cyber security and administrative software
- Recycling sensors
- Digital education platforms
- Predatory social networks
- Digital entertainment
- Online gaming and gambling

Creating a Sustainable Food System

- Plant-based proteins
- Pasture raised animal products
- Unhealthy food derivatives
- Fast-food and fast-casual restaurants with unhealthy meals
- Energy drinks

Unique Solutions for Healthy and Productive Living

- Advanced life sciences instruments and tools
- Novel therapeutics, medical devices, and clinical diagnostics
- Healthcare service providers for underserved and vulnerable populations
- Women's health innovation
- Tobacco
- Firearms
- Bad actors facilitating poor outcomes and preventing best care for all

Financial Services as a Force for Good

- Digital payments for small business
- Equitable banking and lending
- Consumer credit analytics providers
- Affordable student housing
- Subprime auto loans
- Subprime consumer credit
- Lease to own retailers

Products and Services include, but are not limited to, those listed for each Atlas Impact Theme

The 7 Sins of Excessive Consumption:

Tobacco, Gambling, Binge Watching, Social Media, Sodium, Saturated Fat & Added Sugar

We recognize that certain unhealthy behaviors may not be harmful in moderation, such as the occasional indulgence in junk food or various forms of limited screen time. Others, such as tobacco consumption and gambling, more frequently lead to addictions. Regardless, the addictive nature of many of these activities can lead to negative mental and physical health impacts. We aim to highlight those behaviors and outcomes here, captured by our negative impact metrics for companies offering tobacco products; nutrition-poor foods with high saturated fat, added sugars, and sodium; gambling platforms; streaming services; and social media networks.

Notes to our readers

AIP *impact metrics* are **designated by teal blue, bold text** and all **Tables** consist of impact metrics

Referenced *data citations* can be accessed by clicking [dark blue underlined text](#)

Tobacco

Cigarettes cause a [long list](#) of health complications and increase risk of death for smokers and [second hand smoke](#) bystanders. Our impact metrics estimate the annual percentage of deaths from a company's cigarettes for those tobacco companies using government reported mortality data, cigarette attributed cause of death trends from public health organizations, and company reported market shares. 2021 mortality data is not yet available, but based on 2020 reported causes of mortality, Altria's cigarettes were responsible for **42.7%** of lung cancer deaths, **39.3%** of chronic obstructive pulmonary disease (COPD) deaths, and **12.3%** of cardiovascular disease deaths in the United States. On a worldwide scale, excluding the United States and China, Philip Morris' cigarettes were responsible for **21.5%** of lung cancer deaths, **11.4%** of COPD deaths, **5.2%** of coronary heart disease deaths, and **4.9%** of tuberculosis deaths in 2020.

While this data itself is cause for alarm, the negative impact of tobacco companies does not end with cigarettes. In 2021, [84%](#) of Altria's revenues and [71%](#) of Philip Morris' revenues were generated by cigarette sales. The remainder of each company's revenue is increasingly dominated by the rapidly growing category of products they describe as reduced risk tobacco products, more commonly known as smokeless tobacco or vaping products. In support of these markets, Philip Morris launched its [Smoke Free Future](#) campaign and Altria has its [Moving Beyond Smoking](#) efforts, both aimed at transitioning cigarette users to smoke-free product alternatives. PM's stated goal is to aggressively transition its sales to 50% smoke free products by 2025, which we believe is achievable. Both companies claim that transitioning to smoke free devices from cigarettes is a healthier, reduced risk option for consumers who have, although they wouldn't put it this way, developed a nicotine addiction from smoking cigarettes. When focusing solely on the relative comparison of these products to combustible cigarettes, there is some truth. Based on carcinogen concentration consumed, smokeless products are technically lower risk than combustible cigarettes. However, real-world evidence is still lacking to demonstrate the clinical meaningfulness of this reduction in terms of reduction in tobacco product caused cancers, and [preliminary research](#) has suggested that reduced risk products may not actually reduce health complications. We intend to explore this debate in detail in an upcoming Impact Focus Note. Ultimately, regardless of risk profile, all tobacco products still fuel the [nicotine addictions](#) that drive the sales of Philip Morris and Altria. These harmful

business models will continue to fall out of favor as ongoing trends towards health and wellness motivate current tobacco consumers to quit consumption and prevent new users from ever starting.

Unhealthy Foods & Beverages

In our 2021 Annual Impact Report, we explored the negative impacts of unhealthy foods on physical health, primarily through the lenses of obesity, Type II Diabetes, and other associated morbidities. This year, we revisit the negative impacts of unhealthy foods through the lens of behavioral nutrition and the personal decisions that amount to an [estimated \\$173B](#) annual healthcare spend to address obesity in the United States.

Many factors influence consumers' food decisions, including convenience, cost, taste, allergies, personal values, and, sometimes, nutritional value. To help guide Americans towards more balanced dietary choices, the USDA provides the [Dietary Guidelines for Americans](#). The most recent update to these guidelines for 2020-2025 builds on prior editions, with an emphasis on fulfilling recommended daily values of nutrient-dense food groups and limiting intake of foods and beverages that are unhealthy: those that are high in added sugars, saturated fat, and sodium. It is important to understand that daily recommended values vary by age, sex, height, weight, level of physical activity, and other health factors. For the sake of calculation, we base our metrics on the median adult male and adult female diets: approximately 2,500 and 2,000 calories per day, respectively. Recommendations for limiting added sugars and saturated fats are derived from caloric intake and are intended to be 10% of daily calories or less, each. It is worth noting that this is only true when all nutrient-dense daily recommended values are already met. For all adults, the daily recommended sodium intake is 2,300 mg or less. In the UK, the [Government Dietary Recommendations](#) serve the same purpose with very similar guidelines. The exception is that instead of a sodium recommendation, salt intake is recommended to be 6 g or less per day.

First, we look at the negative impact on daily recommended nutritional values of one meal at Domino's Pizza in the UK. Because pizza and its accompanying side dishes are typically served "family style", with multiple servings in one unit, Domino's does provide serving recommendations for all its menu items. We estimate the nutrition facts of an average meal by averaging together the nutritional profiles of all the pizza options, appetizer/side dish options, and dessert options on the menu, and take 1 serving of each. Following these serving recommendations and the local nutritional guidelines, **Table 1** shows that one meal at Domino's UK in 2021 represents approximately half of the recommended daily caloric intake, over half (up to three quarters) of the recommended daily saturated fat intake, and three-quarters of the recommended daily salt intake for adults. Domino's offers a reduced fat mozzarella cheese option as a healthier substitute, but **Table 1** shows that this change does not significantly improve the nutritional value. The recommended serving size of pizza is three slices. Holding appetizer and dessert portions constant, just one additional slice of pizza, or four slices total, brings these values up significantly (**Table 1**). This sensitivity analysis highlights the importance of portion control to combat excess consumption, even when those portions are already more than one meal's worth of the recommended daily values. While we recognize that there are a lot of factors that go into one's decision of what to eat, our impact metrics focus on the nutritional value of the meal.

Table 1: Domino's Pizza UK Average Meal Negative Impact on Daily Recommended Nutrition		
	2,500 Calories/Day <i>Average UK Male</i>	2,000 Calories/Day <i>Average UK Female</i>
<u>For 1 Average Meal: 1 serving (3 slices) of regular mozzarella cheese pizza, 1 serving of appetizer/side dish, 1 serving of dessert</u>		
Percent of Daily Recommended Calories	44%	55%
Percent of Daily Recommended Saturated Fat	57%	73%
Percent of Daily Recommended Salt	77%	77%
<u>For 1 Additional Slice of Pizza + Average Meal: 4 slices of regular mozzarella cheese pizza, 1 serving of appetizer/side dish, 1 serving of dessert</u>		
Percent of Daily Recommended Calories	52%	65%
Percent of Daily Recommended Saturated Fat	68%	88%
Percent of Daily Recommended Salt	95%	95%
<u>For 1 Average Meal: 1 serving (3 slices) of reduced fat mozzarella cheese pizza, 1 serving of appetizer/side dish, 1 serving of dessert</u>		
Percent of Daily Recommended Calories	42%	52%
Percent of Daily Recommended Saturated Fat	40%	52%
Percent of Daily Recommended Salt	74%	74%

Next, we consider the negative impact on daily recommended nutritional values of one meal at Shake Shack. Shake Shack is a fast casual dining experience, which [differentiates](#) itself with fresh, never frozen ingredients, and meals made to order. The company has an extensive [animal welfare policy](#) to ensure that all meat and dairy are sourced from farms that have safe, cage free, and ethical practices and never administer antibiotics or hormones. These commitments, and Shake Shack's other commitments to [good practices](#), are important, but must be separated as exogenous to the impact of the food itself on those who eat it. We assume that an average meal would consist of 1 burger, 1 order of fries, and 1 shake, averaging together the nutritional profiles of all of the burger options, fries options, and shake options on the standard 2021 menu.

Table 2: Shake Shack Average Meal Negative Impact on Daily Recommended Nutrition		
	2,500 Calories/Day <i>Average US Male</i>	2,000 Calories/Day <i>Average US Female</i>
<u>For 1 Average Meal: 1 burger, 1 order of fries, 1 shake</u>		
Percent of Daily Recommended Calories	100%	125%
Percent of Daily Recommended Saturated Fat	195%	244%
Percent of Daily Recommended Sodium	151%	151%

Table 2 shows the results of these calculations: a meal at Shake Shack consists of more than a single day's daily recommended calories, more than a day and a half's daily recommended sodium, and close to two days' worth of daily recommended saturated fat. Shake Shack serves as an important example of how excess consumption does not have to be a result of excess consumed volume, but instead can simply be from excess unhealthy components in an otherwise standard volume of food.

	2,500 Calories/Day Average US Male			2,000 Calories/Day Average US Female		
	Number of Doughnuts:	1	3	6	1	3
Percent of Daily Recommended Saturated Fat	25%	74%	149%	31%	93%	186%
Percent of Daily Recommended Added Sugar	30%	89%	177%	37%	111%	222%

Krispy Kreme serves hot, fresh doughnuts worldwide. To estimate the nutritional values of its product, we similarly average the nutrition facts for each item on Krispy Kreme’s main menu to arrive at the average doughnut’s nutritional content. One doughnut provides between a quarter and a third of the daily recommended saturated fat and added sugar. We also note that Krispy Kreme typically sells doughnuts in multiples, offering better [unit pricing](#) at higher quantities, encouraging excess consumption. **Table 3** shows the negative impacts of excess doughnut consumption on one’s daily recommended values.

Energy drinks have two main components of concern: added sugar for flavor and caffeine for energy. According to the CDC, sugar sweetened beverages are the [leading source](#) of added sugar in American diets, and as we have written previously, consumption can lead to weight gain, obesity, Type II Diabetes, heart disease, kidney and liver disease, and more. Caffeine, consumed at appropriate levels, isn’t inherently dangerous. The USDA [Dietary Guidelines for Americans](#) recommends a threshold of 400 mg of caffeine for healthy adults per day, though it is important to note that this does not hold true for all individuals (for example, there are no safe established levels of caffeine for children, even though [one third of 12-to-17-year-old children](#) consume energy drinks regularly). Energy drinks are of particular concern because in addition to the caffeine reported on the label, there are usually additional stimulants and stimulant enhancing [ingredients](#) present, such as guarana, taurine, B vitamins, and sugar.

Serving Sizes

A recent [survey](#) showed that less than half of Americans actually understand what a serving size is. According to the FDA, [serving sizes](#) are standardized amounts of similar foods and beverages, which are meant to enable consumers to compare one option to another at the same quantity. By law, serving sizes must reflect the average amount of food people consume in one sitting, not how much they should consume. This is standardized by food/beverage category. For example, the serving size for most sodas was changed from 8 fl oz to 12 fl oz.

Each can of Monster Energy actually contains 2 servings worth of energy drink. This can be misleading to consumers, who may take the time to look at the listed caffeine or added sugar values on the label but may not realize that one can contains twice these values, meaning it is twice that of a comparable drink, like [Red Bull](#), which only contains [1 serving per can](#).

Monster Energy is one of the most popular energy drink manufacturers in the US, with approximately one third of the energy drink category’s market share.¹ We use the original Monster Energy flavor’s nutritional information to estimate the brand’s aggregate negative impact. While zero sugar flavors of Monster do exist, these flavors still contain caffeine, and the sugar substitutes used can increase one’s [risk](#) of other health complications such as stroke and coronary

¹ Goldman Sachs MNST Model, 2022

heart disease. **Table 4** shows that just one can, or two servings, of original Monster is already worth almost all of one’s added sugar for the day, and this escalates quickly to become double, and then triple, the recommended daily value with each additional can consumed in a single day.

	2,500 Calories/Day Average US Male			2,000 Calories/Day Average US Female		
<u>Number of Cans of Monster (servings):</u>	1 (2 serv)	2 (4 serv)	3 (6 serv)	1 (2 serv)	2 (4 serv)	3 (6 serv)
Percent of Daily Recommended Added Sugar	86%	173%	259%	108%	216%	324%
Percent of Daily Recommended Caffeine	40%	80%	120%	40%	80%	120%

All the nutritional information used in the metrics above is publicly available, either directly on the food or beverage item’s package or online for a company’s entire menu. Even with all this information, consumers still struggle to make healthy, informed choices. This may be because consuming unhealthy diets that are high in fats and sugars can become addictive. One [clinical trial](#) compared the brain activity from eating two otherwise similar meals: one meal with a high-glycemic index (meaning that it results in a higher and faster rise in blood sugar) and another meal with a low-glycemic index. The high-glycemic index meal stimulated brain regions associated with craving and reward compared to the low-glycemic index meal. Dr. Ashley Gearhardt, who developed the [Yale Food Addiction Scale \(YFAS\)](#), has [shown](#) that processed foods, that contain high fat/high carbohydrate combinations that do not occur in nature, were most likely to be associated with addictive-like eating behaviors. It isn’t a coincidence that all the foods mentioned above, or closely related foods with similar nutritional profiles, appear in **Figure 1**. As population behavior revolutionizes to better prioritize healthy nutrition, food and beverage companies with business models that rely on addictive, excessive consumption of convenient, highly processed products will be a success story of the past.

Figure 1: The 10 Most Addictive Foods
Based on [study](#) participants’ average ratings of how problematic foods were for addictive eating behaviors.

Rank	Food	Processed?
1	Pizza	Y
2	Chocolate	Y
3	Chips	Y
4	Cookie	Y
5	Ice Cream	Y
6	French Fries	Y
7	Cheeseburger	Y
8	Soda (Not Diet)	Y
9	Cake	Y
10	Cheese	N

Gambling

In 2018, the Supreme Court of the United States ruled in [Murphy v. National Collegiate Athletic Association](#) that states had the authority to legalize sports betting. This landmark decision led to a rapid expansion of online gambling across the United States, with [30](#) states legalizing sports betting and [21](#) allowing online sports betting as of July 2022. Consumers across the United States have embraced sports betting, as [45 million Americans](#) were estimated to wager [at least \\$12 billion](#) during the 2021 NFL season. However, the rise in sports betting and online gambling has addiction experts highly concerned about a rise in problematic gambling behaviors, which can have significant implications for both individuals and society at large: the aggregate societal cost of excessive gambling in the US is an [estimated \\$7 billion](#) annually. Additionally, according to a [2022 study](#) conducted by the Addictive Behaviors Journal, sports betting can

actually be more problematic than other forms of gambling. This is because in sports betting, participants have the illusion of placing bets informed by more than just probability.

Despite these concerns, sports betting platforms continue to invest heavily in marketing and promotional offers to boost visibility and gain users. DraftKings, for example, increased its fixed marketing budget for sports sponsorship and ads by 75%, from \$113M in 2020 to \$198M in 2021, and doubled its variable marketing budget for customer acquisition and third-party advertisements, from \$362M in 2020 to \$731M in 2021.² Much of this advertising takes place during live sports broadcasting and on social media sites like Facebook and Instagram and often targets vulnerable populations like teenagers and young adults. With the current gambling addiction rate in the United States at roughly [1%](#), any rise in this percentage could impact millions of Americans and their families. It is worth noting that excessive gambling, or [gambling disorder \(GD\)](#), is considered a psychiatric condition recognized by the American Psychiatric Association, characterized by recurring gambling that results in clinically meaningful dysfunction.

DraftKings is one of the nation's largest sportsbooks. Across its three gambling products, Daily Fantasy Sports, Sportsbook, and iGaming (an online Casino), the company averaged [nearly 1.5 million monthly unique players](#) in 2021, a 69% increase in monthly unique players over 2020 and a 118% increase over 2019. To estimate the negative impact of this service on its growing player base, we calculate the negative financial impacts of gambling per user and determine trends over time, utilizing state-by-state data to calculate the percentage of the US population who had access each platform, the monthly unique player data provided by DraftKings, and DraftKings gross revenue to derive the average money lost per unique player annually. For the Sportsbook product offering, each unique player lost an average of **\$2,008** in 2021. This represents a **30% increase** in individual losses over 2020 and a **97% increase** in losses over 2019. For the iGaming product offering, each unique player lost an average of **\$3,647** in 2021, representing an **84% increase** in individual losses over 2020 and a **481% increase** in losses over 2019. Interestingly, for the Daily Fantasy Sports product, each unique player lost an average of **\$220** in 2021, which represents a **24% decrease** over 2020 and a **43% decrease** over 2019. These metrics demonstrate the rapidly growing utilization of the Sportsbook and iGaming platforms since their legalization. Our negative impact thesis for sportsbooks like DraftKings reflects our view that these companies grow their revenues through the financial costs of gambling addictions, and that this will continue to present an increasingly high regulatory and social risk to sports betting and gambling platforms.

Streaming

The rise of subscription streaming services has led to a significant shift in television viewing habits and consumption of digital content. With the ability to watch whatever, whenever, and wherever, increased accessibility and personal autonomy have led to exponential growth both in the number of streaming services available and the number of subscribers across the globe. As this shift has taken place, so has attention toward the likelihood of streaming services to enable or promote excessive consumption behaviors. According to a [2021 study](#) published by the Addictive Behavior Reports, there were statistically

² Morgan Stanley DKNM Model, 2022

significant rises in binge-watching and serial viewing habits between 2015 and 2020. We will continue to watch these trends as they evolve.

The addictive nature of binge-watching is not new to the Netflix platform: Netflix found that [61%](#) of its users regularly consume between two and six episodes of a show in one sitting. Researchers have been looking into this issue of excessive screen time and binge-watching to understand its effects on physical and emotional health. Clinical psychologist Dr. Renee Carr, Psy.D [explains](#) that the addictive nature of binge-watching is likely the result of chemicals released in the brain, which cause the brain to produce dopamine. Continued watching, or binge-watching, then results in a drug-like high. A pseudo-addiction to the streaming content then occurs as the brain craves this resulting dopamine stream. These neural pathways are the same as those known to function in other addictions, providing biochemical evidence that binge watching television is addictive.

Given the rise in binge-watching and serial viewing behaviors, it is important to consider implications for society at large. Our impact metric for the streaming giant Netflix reflects the negative impacts of lost time spent watching excessive amounts of television in one sitting. We calculate that Netflix had **66.6 million US subscribers** in 2021 and estimate the total aggregate time US adults spent watching Netflix to be over **55.7 billion hours** in 2021. Although Netflix viewing does not typically occur during working hours, to put this aggregate viewing time into perspective, 55.7 billion hours is the US GDP equivalent of **\$6.0 trillion** and US wage loss equivalent of over **\$1.2 trillion** for 2021.

Social Media

The dramatic rise in the popularity of social media platforms over the last decade represents a significant and rapid global shift in human connectivity and communication. As more and more users across all age groups engage with social media, heightened attention has been placed on the addictive nature of these platforms and the negative implications for both productivity and mental health.

Over the last decade, both Facebook and Instagram have seen rapid expansions in the number of users, user engagement, and advertising revenues. This rapid growth has in large part been fueled by intentionally designed algorithms to secure users' attention on the platforms. The predatory nature of these algorithms has been widely publicized and supports our negative impact thesis for Meta Platforms. As Time Magazine [wrote](#), "Often compared to Big Tobacco for the ways in which their products are addictive and profitable but ultimately unhealthy for users, social media's biggest players are facing growing calls for both accountability and regulatory action."

Our impact metrics for Meta Platforms reflect the negative impacts of the addictive nature of Facebook and the time spent on the app. We calculate that Facebook had **174.9 million US daily active users** in 2021 and estimate the total aggregate time US adults spent on the Facebook application to be over **21.2 billion hours** in 2021. To put this aggregate viewing time into perspective, 21.2 billion hours is the US GDP equivalent of **\$2.3 trillion** and US wage loss equivalent of **\$466.9 billion** in 2021.

In addition to the economic impacts of spending excessive time on social media, we also consider the negative mental health impacts these platforms have had regardless of the amount of time spent, especially on adolescents and young adults. As reported in a [2022 study](#) conducted by Haidt et al., mental

health professionals highlight increased rates of depression, anxiety, self-harm, and suicide attempts in teens and adolescents, which began to rise significantly in 2012. This timing aligns with the heightened usage of social media platforms, especially among adolescents. This study assesses the negative mental health implications, especially for teen girls, attributable to social media usage. Through their analysis, the researchers found that “social media use (as opposed to all screen time) for girls (as opposed to all teens) showed much larger relationships with poor mental health” and the magnitude of these effects “are comparable to other factors one would expect to be linked to mental health among adolescents, including binge drinking, sexual assault, obesity, and drug use.”

In September 2021, The Wall Street Journal published a [highly publicized piece](#) outlining the details from a leaked set of internal documents known as [The Facebook Files](#). Utilizing estimates of demographic data for Instagram users and data directly reported from the leaked internal documents, which includes research collected from focus groups, online surveys, diary studies, and large-scale surveys of tens of thousands of people between 2019 and 2021, we were able to estimate the actual numbers of adolescents impacted across the US. We found that The Facebook Files research reported:

- 32% of teen girls said that Instagram made them feel worse about their bodies. This translates to an estimated **1,357,000 teen girls** in 2021.
- 21% of teen girls said Instagram made them feel worse about themselves. This translates to an estimated **890,000 teen girls** in 2021.
- 14% of teen boys said Instagram made them feel worse about themselves. This translates to an estimated **466,000 teen boys** in 2021.
- 9% of all teens said feelings of wanting to hurt themselves started on Instagram. This translates to an estimated **681,000 teens** in 2021.
- 6% of all teens said feelings of wanting to kill themselves started on Instagram. This translates to an estimated **454,000 teens** in 2021.

As public awareness of the negative mental health impacts of Facebook, Instagram, and social media more generally continue to rise, we expect a parallel rise in efforts to reduce excess, harmful consumption of these platforms, especially for the most vulnerable populations.

Circular Economies

Circular business models can be implemented across various industries to minimize resource depletion, emissions, and waste pileup. As defined by researchers in a [review](#) published in the Journal of Cleaner Production, “A circular economy system requires the design and implementation of business models that are based on using as little resources for as long as possible, while extracting as much value as possible in the process.” The following section provides an overview of the positive impact that companies are having while relying on circular business models across water, plastic, and fashion.

Water

According to [reports](#) by UNICEF, four billion people are currently experiencing severe water scarcity for at least one month per year and over two billion people live in places where there is an inadequate supply

of water. UNICEF reports that this could increase to half of the world's population by 2025, and by 2030, over 700 million people could be displaced due to a lack of water supply. Our positive impact theses for two companies, Xylem and Evoqua Water Technologies, reflect our belief that climate tech solutions will have a significant impact on the world's ability to address the global water crisis by reducing water usage, treating water for reuse, and transforming water management.

Xylem provides services across the entire water value chain to address water resource management, greenhouse gas emissions within the water industry, and equitable access to clean water and sanitation. In 2021, Xylem reported several impact metrics across its suite of 20+ water solutions and 30+ product brands. In collaboration with [MIT Shine](#), Xylem analyzed the lifetime sustainability impacts of each product on a per-unit basis and used annual sales volumes to determine the annual impact of its products and services on its customers and communities, which were discussed in the company's [2021 Sustainability Report](#). For 2021, Xylem reported treating **1.08 billion cubic meters** of water for reuse, preventing **1.93 billion cubic meters** of polluted water from flooding communities or entering waterways, reducing this water's CO2 emission footprint by over **0.73 million metric tons**, and providing access to clean water and sanitation for **1.8 million people** living in low income or developing communities.

Evoqua Water Technologies is a leading global provider of water and wastewater management solutions. In the company's [2021 Sustainability Report](#), Evoqua reported that every day across its 30+ products and services the company transforms approximately **100 billion gallons** of water for usage through processes such as wastewater treatment, carbon and resin removal, filtration, and decontamination. The company arrived at this figure using management estimates of total water treated across its suite of products and services.

In order to address the global water crisis, new technologies and circular systems like those deployed by Xylem and Evoqua must be leveraged to protect this vital, limited natural resource.

Plastic

In addition to a global water crisis, we are also experiencing a global waste crisis, and of particular concern, a global plastic-waste crisis. Plastic negatively impacts people and the planet across its value chain, during production, usage, and end of life. The [production](#) of plastic relies on fossil fuel materials and is energy- and greenhouse gas-intensive. While in use, plastic can even be harmful to the people using it: [research](#) has shown that the average person could ingest 2,000 pieces of microplastic per week – approximately 5 grams, or the weight of a credit card. Finally, plastic is harmful to the planet when it reaches the end of its useful life. A [2022 Greenpeace Report](#) found that the United States alone reported volumes of plastic waste of 44 million metric tons in 2019, which is equivalent to roughly 295 pounds per person. This problem is growing globally: according to a recent OECD [study](#), by 2060 global plastic waste will almost triple, doubling the resulting plastic pollution. Although recycling is one way to mitigate plastic waste, rates of plastic recycling have declined in the US in recent years to just [5-6%](#) in 2021. This is down from [9.5%](#) in 2014 and [8.7%](#) in 2018, where reported figures counted millions of tons of plastic exported to China where the majority was really burned or dumped. Globally, the situation has worsened as a result of the COVID pandemic, in what has been called "[The Plastic Pandemic](#)". As a result of increased demand for plastic-based PPE, online shopping shipping materials, and take-out food containers, plastic waste

accumulation soared globally during the pandemic. Also, the pandemic-associated economic slowdown decreased demand for oil, which subsequently cut the prices of new plastic far below that of recycled plastic.

In order to meaningfully address this crisis, innovative solutions and technological advancements in recycling will need to be deployed. TOMRA is a leading technology company providing innovative solutions that enable the circular economy with its advanced collection and sorting systems. TOMRA's suite of products includes [over 80,000 reverse vending machines](#) in 60+ markets, which enable the efficient and effective collection of waste containers for sorting and processing.

TOMRA's [2021 Annual Report](#) presents calculated metrics on the avoided CO2 emissions resulting from the use of its products and services across beverage container collection, packaging material transport and holding, and material sorting for recycling. Utilizing GHG protocol calculation tools, these figures were developed based on TOMRA's actual and estimated sales volume and consumption figures. For TOMRA's beverage container collection services, the company reported annual collections of 42 billion units in 2021, which totaled **3.6 million metric tons** of avoided CO2 emissions. Plastic bottle collections alone made up **1.3 million metric tons** of these avoided emissions. For packaging material transport and handling services, TOMRA calculated CO2 emission savings based on the tons of beverage containers transported and handled and estimated the benefit of collecting and recycling these containers as opposed to dumping them in landfills. Across this service, the estimated total avoided CO2 emissions in 2021 were **911,500 metric tons**. Of this, the avoided CO2 emissions from plastic bottles came out to **100,200 metric tons**. Finally, across material sorting services, TOMRA utilized estimated figures for material throughput across its recycling installations to calculate an estimated **14.9 million metric tons** of CO2 avoided across all materials in 2021, of which an estimated **4.3 million metric tons** of CO2 emissions were avoided across plastic materials. In total, across all products and services, TOMRA estimated its 2021 impact to be **19.4 million metric tons** of avoided CO2 emissions.

As a main pillar of the circular economy, recycling is one of the most significant tools we have for addressing plastic waste pileup. TOMRA is a leading provider of innovative recycling solutions to tackle this global crisis.

Fashion

The textile and apparel industries are significant contributors to the climate crisis. Clothing and shoe production alone are responsible for [8%](#) of annual global greenhouse gas emissions, and the fashion industry as a whole produces [20%](#) of global wastewater. Accelerating consumer demand has also exacerbated these impacts. [The State of Fashion 2019 report](#) published by McKinsey found that the average consumer buys 60% more clothing than they did 15 years ago. Other studies have shown that people discard these clothing items after an average of only [7 to 10 wears](#). A [2022 report](#) from Bloomberg noted that the US throws away up to 11.3 million tons of textile waste each year which is equivalent to roughly 2,150 pieces of clothing per second. While public pressure and proposed policy and regulation are starting to cause a shift in the industry to prioritize sustainability efforts, fashion brands continue to produce more and more clothing at alarming rates to meet consumer demand.

To make progress on crucial sustainability goals, the fashion industry will need to rely on a variety of solutions to meaningfully address the harmful environmental practices that are deeply embedded across the industry. Circular business models offer one such solution. New fashion companies continue to emerge that generate revenues without producing any new clothing. These companies largely fall into one of three categories: resale, recycle, or rental. By relying on these methods, clothes circulate through the economy for longer and shoppers are still satisfied with clothing that is new to them. The Ellen MacArthur Foundation [projects](#) that circular fashion business models could grow from 3.5% of the global fashion market today to 23% by 2030, representing a \$700 billion market opportunity.

Three of the largest players in the circular fashion market are The RealReal, thredUP and Rent the Runway. For each of these companies, we calculate the positive environmental impact of circulating pre-worn or rented clothing through displaced CO2 emissions and gallons of water saved that would have otherwise occurred had the items been produced new. The RealReal is the world's largest online marketplace for consigned luxury goods. We estimate that in 2021 the company displaced **CO2 emissions of 23,528 metric tons** and saved **230,431,300 gallons of water**. We also estimate that thredUP, one of the largest online resale platforms for women's and kids' apparel, shoes, and accessories, displaced an estimated **42,051 metric tons of CO2** and saved an estimated **411,854,400 gallons of water** in 2021. Finally, Rent the Runway is the world's largest clothing rental marketplace, offering subscribers access to over 19,000 styles and the option to purchase discounted, pre-worn items. Utilizing Rent the Runway's membership data, we conservatively estimate the number of items rented per year across its subscriber base. We also use Rent the Runway's process-specific estimates of CO2 emissions and water savings per item, which account for shipping and cleaning of the clothing between renters, to estimate that Rent the Runway displaced **2,784 metric tons of CO2 emissions** and saved **182,672,640 gallons of water** in 2021. Our positive impact thesis for these companies demonstrates our belief that the momentum around circular fashion as a contributor to more sustainable practices in the apparel industry is only getting started.

Renewable Energy & The Future Promise of the Inflation Reduction Act

Climate Change is a global problem, and thus it will take a global solution. However, recent evidence continues to illustrate the more concentrated harms from certain countries in accelerating Climate Change, and thus it is reasonable that these countries would require the most robust climate solutions. The United States is, without a doubt, [one](#) of those most pivotal polluters. In fact, the United States has actually warmed [68% faster](#) than the earth as a whole over the past 50 years, though the negative impacts of the US can be felt in warming temperatures and rising sea levels around the globe.

The Inflation Reduction Act (IRA) was signed into law in August 2022 and serves as the most significant American climate legislation package to date, enabling an energy transition to renewable and clean alternatives and supporting a transition away from the fossil fuels that have resulted in global climate turmoil. While the government estimates the IRA will result in [\\$369 billion](#) in energy security and climate change related investments, Credit Suisse sees upside to this estimate, forecasting it could be more than double, or [over \\$800 billion](#) in public investments over ten years. When applicable, we highlight company commentary regarding the outlook after the passing of the IRA in the sections below.

Environmental Metric Methodology

At Atlas, we are always endeavoring to improve and refine our impact metric methodology. Since our last annual impact report, we have standardized the approach to environmental metrics to calculate the annualized CO2 emissions, or annualized CO2 emissions reduction, from the product or service sold or deployed by the company in the metric year. Any exceptions will be clearly described in the report. We also endeavored to better standardize the approach used in each segment, such as standardizing the approach for all solar companies to be based on kW deployed and sunny hours in the regions of deployment. For this reason, we are restating the 2020 figures along with the 2021 impact metric figures.

Fossil Fuels – A Future Remnant of the Past

Our global reliance on fossil fuels for energy only becomes more problematic with time. According to the International Energy Agency (IEA), the biggest increase in CO2 emissions by sector in 2021 was in electricity and heat production, accounting for [46%](#) of the global increase in emissions over the prior year, driven by increased use of all fossil fuels to meet increased electricity demand. Global warming is the most pivotal component of our negative impact thesis for the fossil fuel industry, supported by the added downsides of controversial energy dependence and negative impacts on public health. Fossil fuel use has resulted in energy dependence on controversial nations resulting in geopolitical risks; look no further than the ongoing European energy crisis as a result of heavy [reliance](#) on Russian gas exports, or the US [easing sanctions](#) on Venezuela for oil. Also, air pollution resulting from fossil fuel generated electricity costs the US [up to \\$886.5B](#) in healthcare costs annually. Greenpeace [reports](#) that a disproportionate amount of the negative health impacts of both extracting and burning fossil fuels in the US fall on low income and minority communities.

Coal is the dirtiest fossil fuel, responsible for [0.3 of the 1 degree Celsius](#) increase in global average temperatures, and [40%](#) of the total growth in global CO2 emissions in 2021. What's discussed less often is that coal also presents public health risks. Coal mining and burning both [result](#) in exposure to respiratory irritants and carcinogens that further endanger those working in and those living near coal mines and coal power plants.

Arch Resources operates coal mines across the US, producing two main subsegments of coal: [thermal coal](#), typically burned to generate electricity, and [metallurgical coal](#), also known as coal coke, previously an essential input in the production of iron and steel. We note that the innovation of the electric arc furnace (EAF) has made it possible to produce these necessary metals without the input of metallurgical coal. EAFs reduce carbon intensity by an estimated [75%](#) and make up [70%](#) of US steel manufacturing today, but only [29%](#) of global steel manufacturing. However, due to the [favorable economics](#) of metallurgical coal, Arch has shifted its priority to this industrial input. Arch produced [10%](#) of US

metallurgical coal volumes in 2020 and grew its market share to [11%](#) in 2021. This is problematic because different types of coal have different [greenhouse gas footprints](#). Aggregated together and converted into CO2 emission equivalents, we calculate that thermal coal emissions equivalents range from **1.7 to 2.3 metric tons per ton of coal**, whereas metallurgical coal emissions equivalents are **2.8 metric tons per ton of coal**. **Table 5** shows our calculated impact metrics for Arch Resources, based on the aggregation of the volumes and types of coal produced and their emissions footprints when consumed as a product. Thus, Arch’s [claims](#) that realigning itself with more metallurgical coal, versus thermal coal, is an effort to align with “the global economy's intensifying focus on de-carbonization” are just a farce. No amount of coal production, of any kind, can truly align with a green future, and thus we maintain that such coal producing companies can only be considered negatively impactful.

Crude oil is refined and used to generate the energy that still powers the [majority](#) of US transportation, and the largest share of US utility scale electricity is generated from natural gas ([38.4%](#)) as of 2021. ExxonMobil is currently the [largest](#) US based oil and gas company based on revenue. Although the company has some publicized renewable resource initiatives, it has been widely accused, and mostly [proven guilty](#), of greenwashing its attempts at climate action. Also in the crude oil industry, Dril-Quip designs and manufactures offshore rig equipment used to extract crude oil. Recall our methodology measures the carbon emissions associated with the use of the product or service of a company sold during the metric year. Since Dril-Quip’s product is an oil rig, its metric reflects the emissions of the rigs in operation during that year. This is an exception to the standard method of only calculating the emissions for the product sold in the year listed, because Dril-Quip only reports current rigs, not rigs deployed each year (this is why Dril-Quip’s emissions are calculated to be the highest). **Table 5** also shows the calculated impact metrics for these oil and gas companies in 2021.

Table 5: Negative Impacts of Fossil Fuels		
<i>All values are given in metric tons of annualized CO2 emission equivalents produced by the fossil fuels & enabling products sold in the year listed</i>		
	2020	2021
Arch Resources (coal)	113,495,707	133,376,044
ExxonMobil (crude oil, natural gas, and natural gas liquid)	454,189,210	441,367,527
Dril-Quip (offshore oil rigs)	901,295,401	1,036,293,481

Solar

In order to transition away from fossil fuels, we need reliable and scalable infrastructure for renewable energy sources. The most well-known of these renewables is arguably solar. Solar energy comes from electromagnetic radiation from the sun. This light energy is captured and converted to electrical charges on photovoltaic (PV) solar [panels](#). First Solar is a US based PV module (panel) manufacturer. These solar panels create direct current (DC) electricity, which solar [inverters](#) convert to alternating current (AC), which is the type of electricity used in the grid. SMA Solar Technology, SolarEdge Technologies, and Enphase Energy represent examples of positive impact solar inverter companies. The CO2 emissions avoided by the solar systems these components enable are shown in **Table 6**.

Another component of the solar system is the advent of solar trackers. Solar trackers allow for the solar panel to rotate throughout the day to follow the sun’s path, allowing for the solar panels to absorb more direct solar radiation. Array Technologies is a leading utility scale solar tracker provider, whose solar trackers result in a [25% increase](#) in solar energy output compared to a fixed tilt, non-tracking system. We calculate the positive impact of these trackers in terms of this incremental energy that they enable, shown in [Table 6](#).

We also measured the positive impacts of residential solar suppliers, Sunnova and Sunrun, in 2021. In addition to the renewable energy benefits of utility scale solar, we highlight that residential solar with storage also gives consumers energy independence and flexibility, making residential solar a more viable solution for continuous power supply. We calculate the positive impact of these residential solar installers in [Table 6](#) in terms of the CO2 emissions avoided by the systems they deploy.

As of the end of 2021, Ormat owned and operated [1,100 MW](#) of geothermal, energy storage, Recovered Energy Generation, and PV solar power sites globally. We consider Ormat’s product to be the clean electricity it delivers to customers, and report its impact metric in [Table 6](#) based on the CO2 emissions avoided by the clean electricity generated in a given year.

Table 6: Positive Impacts of Solar Energy		
<i>All values are given in metric tons of annualized CO2 emission equivalents avoided by the solar products sold in the year listed</i>		
	2020	2021
First Solar	5,069,350	7,281,430
SMA Solar Technology	8,058,544	9,756,029
SolarEdge Technologies	9,625,246	11,191,129
Enphase Energy	4,095,823	6,583,332
Array Technologies	3,546	4,048
Sunnova Energy	407,511	673,549
Sunrun	1,191,090	1,563,824
Ormat Technologies (solar & geothermal)	4,285,191	4,629,160

The solar industry stands to benefit from the IRA from the extensions of existing provisions and addition of new provisions. [First Solar](#) highlighted on its third quarter 2022 earnings call that the announcement of the IRA passing resulted in \$1.5B of commitments. There are many provisions designed to benefit American made solar components that First Solar stands to benefit from. To reap as much of the IRA benefits for domestic manufacturing as possible, First Solar and [Enphase Energy](#) are both investing in expanding existing manufacturing capacity in the US, [Array Technologies](#) plans to expand its domestically sourced inputs, and [SolarEdge](#) plans to begin to produce its product in the US starting in 2023. All these companies noted that there are still many aspects of the IRA that need to be ironed out before implementation can truly take off.

[Sunrun](#) commented on a recent earnings call that the Investment Tax Credit (ITC) extension of another ten years, and increasing the ITC from 26% back to the 30% level, will benefit Sunrun and its partners. Sunrun highlighted the inclusion of provisions to expand solar in more low-income communities and multifamily properties. Sunrun already serves nearly 10,000 households in low-income, multifamily

housing, and intends to use the IRA provisions to continue to increase the company’s positive impact on these communities.

Wind

While solar energy is used in a wide range of applications from residential to commercial to utility scale, wind energy requires larger components best used at utility scale. Our positive impact thesis for companies enabling wind energy reflects our view of the viability of this renewable energy solution, both on shore and off shore. Vestas Wind Systems is a wind turbine manufacturer and servicer worldwide, and TPI Composites is a manufacturer of composite wind blades and related assembly components. The positive impact of these companies based on the emissions they helped to avoid with a clean energy source are shown in **Table 7** below. For more general commentary on the IRA provisions for wind, and for other renewables, we refer readers to our most recent quarterly letter.

Table 7: Positive Impacts of Wind Energy		
<i>All values are given in metric tons of annualized CO2 emission equivalents avoided by the wind products sold in the year listed</i>		
	2020	2021
Vestas Wind Systems	37,391,834	38,348,024
TPI Composites	26,484,512	27,912,720

Hydrogen

Hydrogen has the potential to be a very viable clean energy source, but this is fundamentally dependent on how the hydrogen is produced. [Gray hydrogen](#) is produced from natural gas using an energy-intensive and high emissions process. [Blue hydrogen](#) is very similar to gray hydrogen, except emissions are captured during production of the hydrogen, but not during the production and transportation of the natural gas to the blue hydrogen manufacturing site. According to the US Department of Energy, [95%](#) of the hydrogen on the market today is produced from steam reforming of natural gas. [Green hydrogen](#) is produced in an electrolyzer through the process of electrolysis, in which electricity is added to water to generate hydrogen and oxygen, without generating any direct emissions. If the electricity required is sourced from a renewable source, the process is completely clean. Once hydrogen fuel is produced, it is added to a [fuel cell](#), which generates electricity and water without any emissions. Thus, the fuel cell is simply the reverse of the electrolyzer, where one side of the reversible equation is hydrogen and oxygen, and the other is electricity and water.

Bloom Energy sells large-scale, solid oxide fuel cell-based power generation systems to commercial and industrial customers. Bloom’s fuel cells can use hydrogen, biogas, or natural gas to generate power at higher efficiencies than combustion-based power sources. The ability for these fuel cells to use natural gas as an input is a key enabler of the energy transition: commercial consumers can start using the fuel cells with natural gas as an input, and as cleaner solutions such as green hydrogen and biogas become more easily available, transition to those inputs. It is worth noting that while natural gas extraction is still a dirty, fossil fuel process, natural gas is not combusted when used to generate energy in Bloom’s fuel cells, so it is a [near zero emissions](#) energy generation process at the point of use. The positive impact of

Bloom’s solid oxide fuel cells sold each year is shown in **Table 8** below. Bloom also utilizes the same solid oxide platform to make electrolyzers, which [produce](#) green hydrogen.

Plug Power sells proton exchange membrane (PEM) hydrogen fuel cells solutions that are compatible with existing electric motors that would otherwise be powered by fossil fuels. Plug Power’s fuel cells have mainly been deployed in the form of its GenDrive product, into industrial and warehouse material handling vehicles thus far. For this reason, the impact metric shown in **Table 8** is based on the positive impact of the GenDrive units sold in each year. Plug Power has [begun](#) to expand into additional end markets, including on-road vehicles, aviation, and large scale stationary power.

Table 8: Positive Impacts of Hydrogen Energy		
<i>All values are given in metric tons of annualized CO2 emission equivalents avoided by the hydrogen products sold in the year listed</i>		
	2020	2021
Bloom Energy	824,121	1,167,816
Plug Power	564,557	764,737

The IRA is arguably the most transformative for the hydrogen energy industry, because the legislation enacts completely novel benefits for this renewable energy source. [Bloom Energy](#) has said that the hydrogen Production Tax Credit (PTC) makes electrolyzers a more exciting and viable business in the US, and on the whole Bloom has seen the velocity of its deals increase as a result of the IRA. [Plug Power](#) further emphasized the importance of the PTC. The IRA provides a \$3 PTC for every kilogram of hydrogen produced. This PTC has the potential to take the payback period on Plug’s green hydrogen plants from 8-12 years down to 4-5 years.

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