



Advanced Emissions Solutions, Inc.

Advancing **Cleaner** Energy

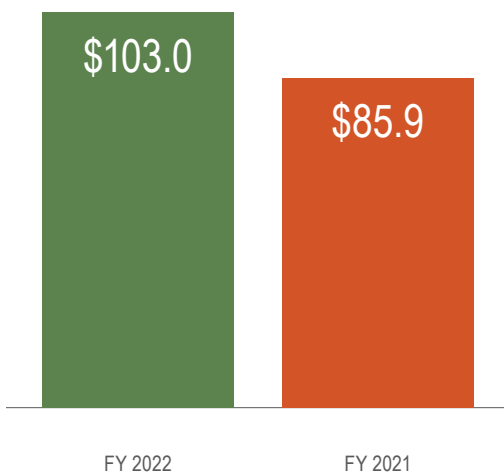
2022 ANNUAL REPORT

2022

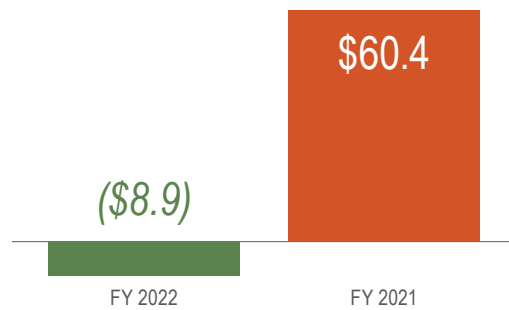
Financial Highlights

(\$ in millions, 12-months ended)

CONSUMABLES REVENUE

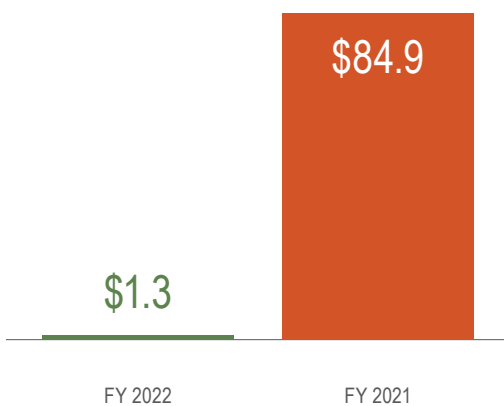


NET INCOME (LOSS)



ADJUSTED EBITDA ⁽¹⁾

⁽¹⁾ Adjusted EBITDA is a non-GAAP measure.
Please reference the reconciliation in our Form 10-K



CASH & EQUIVALENTS

■ Restricted Cash



During the past year, we took transformative steps to reposition our business for long-term growth and to lay the foundation for future success.



In our first full year since the expiration of the Section 45 tax credit generation period and wind down of our Tinnuum investments, we delivered record consumables sales and financial performance at our Red River plant, and dramatically improved our accessible markets and future earnings potential with the acquisition of the subsidiaries of Arq Limited (Arq).

We have already begun to execute the initial phase of our business plan to transform our business into a differentiated, environmental technology company, as we have secured a vertically integrated, high-purity and high-performance bituminous based feedstock to further penetrate the growing Granular Activated Carbon (GAC) markets. I'd like to thank our shareholders for their continued support, and to recognize our outstanding team members for their hard work throughout this process.



2022

During 2022, our Red River operations delivered a record full year revenue performance, exceeding our original expectations for the year. Total revenue of \$103 million represents growth of 3% compared to the prior year, despite the absence of \$14 million of recurring royalties from our Tinnuum investments due to the conclusion of the Section 45 tax credit generation period at the end of 2021. Looking solely at our consumables sales, revenue increased 20% due to a combination of strong demand from Power Generation customers, successful pricing initiatives and product mix improvements. We saw continued growth in sales to the Water and Industrial Markets, in addition to the strong demand, driven in large part by elevated natural gas prices, from our Power Generation customers.

Our full year 2022 consolidated production volume also exceeded our expectations. While near-term operational costs will likely continue to be challenged by the current inflationary environment, we continue to improve our inventory position, both from a volume and product mix perspective. Overall, 2022 was the single best year of performance for our activated carbon assets since acquiring them in 2018.

Our Red River plant and activated carbon assets are calibrated to produce Powder Activated Carbon (PAC) products ideally situated to support our current market focus. However, the long-term earnings profile of these assets, and our business in general, will be challenged given our exposure to markets such as Power Generation, where coal-fired power generation is in secular decline.

Why Arq?

With this in mind, we sought to identify ways to broaden our product portfolio, expand our participation to new markets, and capitalize on higher growth applications for activated carbon technologies. The result was our announcement to acquire Arq – undoubtedly the catalyst to enable our next significant steps forward. The acquisition marked the culmination of a 15-month strategic review process during which the Board and management evaluated multiple options to maximize shareholder value and position the Company on a path towards sustainable profitability. We are thrilled to be partnering with Arq to pursue future opportunities within the expansive Activated Carbon (AC) market, through the expansion of our product offerings to include bituminous-based GAC, and to address new markets that Arq’s patent protected products are uniquely suited to serve.



Industrial economies around the world will continue to require innovative and high-performance purification technologies, and our integration with Arq provides unique opportunities to sell into these growing markets and to preserve clean air and water resources. Thus, the acquisition repositions the business to expand our commercial growth opportunities in high growth and higher margin AC markets by enabling us to develop and produce new GAC products, using Arq powder™ as a high purity and high-value bituminous-based feedstock.

Most importantly, the diversification of our product portfolio allows for the mitigation of longer-term headwinds, specifically within the coal-fired power space, that our existing lignite-focused AC business would otherwise encounter. The expansion of our AC product portfolio to include bituminous-based products will allow us to address more than 80% of the North American AC market versus the 35% that is currently addressable using our existing lignite-based products.

The acquisition also opens the door to new, non-AC markets that Arq is currently pursuing and that otherwise would not be available to us within our existing business. These growth and diversification opportunities include additives for Asphalt, Carbon Black, and other products.

Additionally, we expect a competitive advantage via product performance, longer-term sustainable production cost, and environmental benefits compared to other AC producers. The competitive value of securing a high-quality, domestically sourced feedstock that is cost competitive and vertically integrated into the combined operations, and that has been shown to create high-performance products, cannot be overstated. As a result of the Arq transaction we are the only North American AC manufacturer that controls 100% of its primary feedstock needs, both through our existing resource operations as well as through our exclusive access to Arq powder™. Further, Arq’s processes for converting coal waste into Arq powder™ are patent protected, providing a platform for long-term success. Our operations will also reclaim land for future use as well as the generation of excess electricity from our manufacturing processes that is returned to the grid, providing a potential Environmental, Social and Governance (ESG) benefit that we, and our customers, will look to monetize as we move forward.

Lastly, we believe that the combination of our existing technical, operating and sales capabilities results in reduced execution risk as we enhance the production capabilities of the business and transition to producing a broader range of products. Our proven manufacturing assets, product technology, applications expertise, sales channels and customers within the AC markets, combined with Arq’s patented feedstock and Corbin manufacturing assets, present a compelling opportunity to capitalize on the combined infrastructure and capabilities of the company.

Capital Position

Our balance sheet remains a key strength for us. We ended the year (2022) with a cash position of \$76.4 million, which will help to facilitate our growth plans for 2023, including capital improvements at Red River and Corbin, as well as the ongoing organic investment in our manufacturing assets. We also announced in September that we had reached an agreement to sell the Marshall Mine and remove the retirement obligation from our balance sheet. The sale of the Marshall Mine occurred in March of 2023. This transaction de-risks our balance sheet as we focus on our future and initiatives related to the Arq integration, and creates a cleaner balance sheet that is better suited for executing our growth plans.

2023 Outlook

As we entered 2023, we expected our existing operations at Red River to deliver strong top-line performance as we balanced future pricing initiatives and a diverse sales and commercial pipeline supported by strong natural gas pricing. We also expected that our near-term margins would be impacted by the higher cost per unit of production as a result of a planned, routine plant turnaround, inflationary impacts on a number of operational costs and external sourcing of supplemental carbon, albeit at reduced volumes.

We are proactively addressing these manufacturing cost pressures through increased average selling price and positive changes in our product mix, as well as targeting markets and end use customers with improved economics. We have maintain high renewal rates with customers at more favorable economic terms, and our average selling price continues to trend higher as a result. Maintaining these high renewal rates with existing PAC customers and aligning prices to market conditions will remain a core focus in 2023. However, we have seen significant near term reductions in natural gas pricing which may negatively impact demand in our power generation portfolio. With the headwinds we are encountering due to changes in natural gas pricing, we believe this is a clear example why the acquisition of Arq and the ability to produce GAC products is critical to our future ability for market diversification.

Upon closing the Arq acquisition on February 1st, we immediately began taking steps to execute the first phase of our combined business plan. Our priorities are clear, and the operational and capital spending plans are in place to support our intended growth. We are focused on ensuring a smooth integration of the Arq team and assets and taking the first steps toward positioning the business for long-term success and sustainable profitability.

Two of our key priorities that we commenced are the capital work necessary to optimize both the Red River and Corbin facilities for industrial-scale GAC production and Arq powder production and developing the customer and sales channels for entry into new markets.

The most significant of these modifications relates to the Red River plant and includes the installation of shaping and heat treatment processes that will enable the processing of a bituminous based feedstock to manufacture new GAC products. Ultimate completion of the first phase of this project is expected to occur in the second half of 2024. Additionally, capital projects at our Corbin facility are underway, including throughput enhancements, automation and product load out capabilities, which are expected to be completed by the first quarter of 2024. These capital improvements are part of the initial phase of our business plan, are fully funded through available cash, and will not interrupt our existing operations at Red River. We do not expect any customer supply impact as a result of these capital upgrades.

Our 2023 focus will also include engaging with lead GAC customers and building our sales channels within the North American GAC market. We expect to undertake further product testing to enable commercial sales of Arq powder™ as an additive for Asphalt and Carbon Black upon the completion of planned upgrades to the Corbin facility.

Financially, for the full year 2023, we expect to generate roughly \$106 million of revenue and slightly below breakeven EBITDA, excluding one-time costs associated with the Arq acquisition and subsequent integration activities, although these targets may be negatively impacted by changes in natural gas pricing that the market is experiencing.

The integration of Arq's feedstock into our Red River plant over time will improve our unit economics with higher-priced and higher-margin products, as well as allow us to continue to become more diversified related to both our product technology and end market opportunities.

Closing

We are acutely focused on capitalizing on the opportunities ahead of us to meet the demands of the structurally underserved North American AC market as well as other opportunities in expanded markets. Our operations at Red River remain strong and are complemented by internal actions to improve our product mix and earnings profile. Meanwhile, the acquisition of Arq marks another important step toward solidifying our future and delivering on our commitment to create additional shareholder value. The result is a truly differentiated, environmental technology company with new growth avenues and a path toward long-term, sustainable profitability.

We are confident we have the right team in place to execute our business plan and to position the business for long-term, sustainable profitability. As we progress into 2023 and beyond, shareholders can expect to receive enhanced communication and greater visibility into our progress as we seek to engage the investor community and deliver on the expected results we have outlined as it relates to the Arq integration and our future business growth.

I'd like to once again thank everyone for their continued interest and support in Advanced Emissions Solutions, Inc. I look forward to our shared success and updating you throughout the year.



A stylized, handwritten signature in black ink, consisting of several loops and a long horizontal stroke at the end.

Greg Marken

President, CEO and Treasurer

Executive Officers



Greg Marken
President, Chief Executive
Officer and Treasurer



Joe Wong
Chief Technology Officer



Morgan Fields
Chief Accounting Officer

Board of Directors



L. Spencer Wells⁽¹⁾⁽³⁾⁽⁵⁾
Partner
Drivetrain Advisors



Carol Eicher⁽⁴⁾⁽⁵⁾⁽⁶⁾
Director
Tennant Company



Richard Campbell-Breeden⁽⁶⁾
Founder
Omershorn Capital Advisors



Julian McIntyre
Founder
Arq Limited



Gilbert Li⁽⁷⁾
Co-founder & Managing Partner
Alta Fundamental Advisors



Jeremy Blank
Chief Investment Officer
Community Fund



J. Taylor Simonton⁽²⁾⁽⁷⁾
Director

- (1) Chairperson of the Board of Directors
- (2) Chairperson of the Audit Committee
- (3) Chairperson of the Compensation Committee
- (4) Chairperson of the Nominating and Governance Committee
- (5) Member of the Audit Committee
- (6) Member of the Compensation Committee
- (7) Member of the Nominating and Governance Committee

Shareholder Information

STOCKHOLDER CORRESPONDENCE:

Advanced Emissions Solutions, Inc.
Attn: Corporate Secretary
8051 E. Maplewood Ave, Suite 210
Greenwood Village, CO 80111
Telephone: 888-822-8617

TRANSFER AGENT:

Computershare
8742 Lucent Blvd, Suite 225
Highlands Ranch, CO 80129

INVESTOR RELATIONS:

Security analysts, investment professionals and stockholders can find investor relations information on the Internet at www.advancedemissionsolutions.com.

Inquiries should be directed to:

Alpha IR Group
Ryan Coleman or Chris Hodges
Telephone: 312-445-2870
Email: ades@alpha-ir.com

MARKET INFORMATION FOR COMMON STOCK

ADES common stock is quoted on the Nasdaq Global Market under the symbol "ADES."

ANNUAL MEETING OF STOCKHOLDERS

The annual meeting will be held on Tuesday, June 13, 2023 via a virtual meeting. A notice of the meeting, together with a Proxy Statement and the Annual Report will be made available to stockholders on or about April 27, 2023 at which time proxies will be solicited by the Board of Directors.

AVAILABILITY OF PROXY STATEMENT AND FORM 10-K

The Proxy Statement and the Form 10-K are available on ADES' web site at www.advancedemissionsolutions.com and at the SEC's web site at www.sec.gov. Additional copies of the Proxy Statement or the Annual Report may be obtained without charge by written request to the Corporate Secretary as listed above.

INDEPENDENT REGISTERED PUBLIC

ACCOUNTING FIRM

Moss Adams LLP
675 15th Street, Suite 1900
Denver, Colorado 80202

NON-INCORPORATION OF FORM 10-K "WRAP"

Advanced Emissions Solutions, Inc.'s Annual Report on Form 10-K for the fiscal year ended December 31, 2022, as filed with the SEC, is included within this Annual Report. Other than the Form 10-K, all other portions of this Annual Report are not "filed" with the SEC and should not be deemed so.

CERTIFICATIONS

The most recent certifications by our Principal Executive Officer and Principal Financial Officer pursuant to sections 302 and 906 of the Sarbanes-Oxley Act of 2002 are filed as exhibits to our Form 10-K.

United States
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

FORM 10-K

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended December 31, 2022

or

TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
Commission File Number: 001-37822

Advanced Emissions Solutions, Inc.

(Name of registrant as specified in its charter)

Delaware
(State of incorporation)

27-5472457
(IRS Employer
Identification No.)

8051 E. Maplewood Ave, Suite 210, Greenwood Village, CO, 80111
(Address of principal executive offices) (Zip Code)

(Registrant's telephone number, including area code): (720) 598-3500

Securities registered under Section 12(b) of the Act:

Class	Trading Symbol	Name of each exchange on which registered
Common stock, par value \$0.001 per share	ADES	Nasdaq Global Market

Securities registered under Section 12(g) of the Act: None

Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes No

Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or 15(d) of the Act. Yes No

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes No

Indicate by check mark if disclosure of delinquent filers in response to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K.

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer or a smaller reporting company. See definition of "large accelerated filer," "accelerated filer" and "smaller reporting company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	<input type="checkbox"/>	Accelerated filer	<input checked="" type="checkbox"/>
Non-accelerated filer	<input type="checkbox"/>	Smaller Reporting Company	<input checked="" type="checkbox"/>
		Emerging growth company	<input type="checkbox"/>

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the registrant has filed a report on and attestation to its management's assessment of the effectiveness of its internal control over financial reporting under Section 404(b) of the Sarbanes-Oxley Act (15 U.S.C. 7262(b)) by the registered public accounting firm that prepared or issued its audit report.

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Act.) Yes No

The aggregate market value of the voting stock held by non-affiliates of the registrant was approximately \$75.5 million based on the last reported bid price of the Common Stock on the Nasdaq Global Market on June 30, 2022. The number of shares outstanding of the registrant's Common Stock, par value \$0.001 per share, as of February 24, 2023 was 26,824,177.

Documents Incorporated By Reference

Portions of Part III of this Form 10-K are incorporated by reference from the Registrant's definitive proxy statement to be filed with the Securities and Exchange Commission no later than 120 days after the end of the Registrant's fiscal year.

ADVANCED EMISSIONS SOLUTIONS, INC.
ANNUAL REPORT ON FORM 10-K
FOR THE FISCAL YEAR ENDED DECEMBER 31, 2022

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PART I

Item 1. Business

General

ADA-ES, Inc. ("ADA"), a Colorado corporation, was incorporated in 1997. Pursuant to an Agreement and Plan of Merger, effective July 1, 2013, Advanced Emissions Solutions, Inc. ("ADES"), a Delaware company incorporated in 2011, succeeded ADA as the publicly-held corporation and ADA became a wholly-owned subsidiary of ADES. In 2018, we acquired ADA Carbon Solutions, LLC ("Carbon Solutions") as a means to enter into the broader activated carbon ("AC") market and to expand our product offerings in the mercury control industry and other applicable AC markets. In February 2023, we acquired the subsidiaries of Arq Limited (hereafter the Arq Limited subsidiaries referred to as "Arq") to secure access to a unique feedstock, a manufacturing facility and certain patented processes as a means to further expand our product offerings. This Annual Report on Form 10-K is referred to as the "Form 10-K" or the "Report." As used in this Report, the terms the "Company," "we," "us" and "our" means ADES and its consolidated subsidiaries.

We sell consumable products that utilize AC and chemical-based technologies to a broad range of customers, including coal-fired utilities, industrials, water treatment plants and other diverse markets. Our proprietary technologies and associated product offerings provide purification solutions to enable our customers to reduce certain contaminants and pollutants to meet the challenges of existing and potential future regulations.

As of December 31, 2022 and 2021, we held equity interests of 42.5% and 50.0% in Tinium Group, LLC ("Tinium Group") and Tinium Services, LLC ("Tinium Services"), respectively, which are both unconsolidated entities, and through December 31, 2021, both contributed significantly to our financial position and results of operations. We account for Tinium Group and Tinium Services under the equity method of accounting. As a result of the expiration of Internal Revenue Code ("IRC") *Section 45 - Production Tax Credit* ("Section 45") refined coal tax credit program effective December 31, 2021, both Tinium Group and Tinium Services have substantially ceased operations as of December 31, 2021 and wound down their operations. Further, Tinium Group is in the process of completing reclamation activities.

Markets

AC is a specialized sorbent material that is used widely in a host of industrial and consumer applications to remove impurities, contaminants and pollutants from gas, water and other product or waste streams. AC is produced by activating carbonaceous raw materials, including wood, coal, nut shells, resins and petroleum pitch. Properties such as surface area, pore volume, surface chemical functionalities and particle size can be specifically engineered to selectively target various contaminants to meet end-use application requirements. AC can come in several different forms that are important for the end-use application, including powdered activated carbon ("PAC"), granular activated carbon ("GAC"), pellets, honeycombs, blocks or cloths.

Key markets include removal of pollutants from coal-fired electrical generation and other industrial processes, treatment of drinking and waste waters, industrial acid gas and odor removal, automotive gasoline emission control, soil and ground water remediation and food and beverage process and product purification.

Demand for AC products has been, and is expected to continue to be, driven by increasing environmental regulations pertaining to water and air purification, especially in the developed and more industrialized areas of the world. Additionally, we believe enhanced environmental and health advisory issues will continue to drive demand for AC in rapidly developing countries.

We see opportunities and are continuing to pursue diverse markets for our purification products outside of coal-fired power generation, including industrial applications, water treatment plants and other end markets. In addition, we see significant opportunities emerging in the soil, sediment and groundwater treatment markets. Increased environmental attention has been drawn to the monitoring and treatment of heavy metals, organic and inorganic compounds in groundwater to improve overall drinking water quality across North America. AC, in various forms, has and will continue to play a key role in these remediation efforts.

Our Business

Our products are used to purify contaminated liquid and gas streams from a variety of industrial sources including coal-fired power plants and waste-water treatment plants and other end markets. Most of the North American coal-fired power generators installed equipment to control air pollutants, such as mercury, prior to or since the implementation of the Mercury and Air Toxics Standards ("MATS"). However, many power generators need consumable products to complement the operation of installed equipment on a recurring basis to chemically and physically capture mercury and other contaminants. AC has been adopted as the most widely-used technology to capture mercury due to product efficiency and effectiveness, and currently accounts for the majority of the mercury control consumables in the North American market. We offer AC and other chemical products and work with customers as they develop and implement a compliance control strategy which utilizes the consumables solutions that fit with their unique operating and pollution control configuration.

For the purification of water, AC has been used in the treatment of drinking water, wastewater, contaminated soil and groundwater to adsorb compounds causing unpleasant taste and odor and other contaminants. Both industrial and municipal wastewater treatment plants have deployed the use of AC in their treatment processes. Groundwater contamination has become a matter of increasing concern to federal and state governments as well as to the public, especially over recent years. The U.S. AC market may see significant growth from water purification markets, especially if future regulations are passed controlling certain chemicals in drinking water. At present, individual states are primarily responsible for the protection of groundwater. The existing technologies for treatment, including removal of the soil for external treatment or landfill, pumping the groundwater above surface for treatment and/or installing treatment trenches or barriers, are expensive and may have complicated life-cycle management requirements. An emerging technology generating increasing interest by site engineering firms and owners is injecting highly engineered ACs into the subsoil, also described as "in situ" treatment, to intercept the contamination plume or to treat the groundwater. In response to this market opportunity, in late 2021, we developed a new Colloidal Carbon Product ("CCP") platform, FluxSorb IS™, which is currently in the initial stages of in-field testing at multiple contaminated soil and groundwater remediation treatment sites.

Coal-fired power plants continue to be a significant, though declining, source of electricity in the U.S. Demand for our AC products related to coal-fired electricity generation is dependent on the availability and cost of alternative energy sources, such as natural gas, solar and wind energy. We see opportunities to continue pursuing diverse markets for our purification products outside of coal-fired power generation, including industrial applications, water treatment plants and other markets.

Sales and Customers

Sales of consumables are primarily made by the Company's employees to a range of end customers, including coal-fired utilities, industrial companies, water treatment plants and other customers. Our AC sales are generally made under requirements-based contracts ranging from one to five years. Our chemical product sales are generally made on an order by order basis. Revenues from our top three customers comprised approximately 37% of our consolidated consumables revenues for the year ended December 31, 2022, and the loss of any of these customers would have a material adverse effect on our operating results.

Norit Supply Agreement and Related Agreements

On September 30, 2020, we and Cabot Norit Americas, Inc., ("Norit") entered into a supply agreement (the "Supply Agreement") pursuant to which we agreed to sell and deliver to Norit, and Norit agreed to purchase and accept from us, certain lignite-based AC products ("Furnace Products"). The term of the Supply Agreement is for 15 years with 10-year renewal terms that are automatic unless either party provides three years prior notice of intention not to renew before the end of any term.

Under the Supply Agreement, Norit also reimburses us for certain capital expenditures incurred by us that are necessary to manufacture the Furnace Products. Reimbursements are comprised of revenues earned from capital expenditures incurred that will benefit both us and Norit (referred to as "Shared Capital") and revenues earned from capital expenditures incurred that will benefit Norit exclusively (referred to as "Specific Capital"). In the event that Norit ceases to make purchases under the Supply Agreement, Norit is obligated to pay the balance of any outstanding payments for Specific Capital.

Further, under the terms of the Supply Agreement, Norit was obligated to pay us \$10.2 million of the certain reclamation costs (the "Reclamation Reimbursement") incurred under a reclamation contract entered into by us and a third party for full reclamation of the Marshall Mine (as defined below), inclusive of interest.

On February 25, 2022, we received \$10.6 million in cash from Norit (the "Norit Payment") as a result of a change in control provision in the Supply Agreement (the "Change in Control"), which occurred as a result of the sale of Norit by its parent, Cabot Corporation. Under the Change in Control, we received from Norit full payment of all amounts outstanding under the Reclamation Reimbursement, payment of all unbilled amounts related to Specific Capital for expenditures incurred through February 28, 2022 and payment of \$0.8 million related to additional costs due to the third-party operator of Marshall Mine (the "Norit Reclamation Costs"). Under the reclamation contract, we were obligated to remit payment for the Norit Reclamation Costs to the third-party operator of the Marshall Mine, and such payment was remitted in March 2022. The Change in Control did not impact any other provisions of the Supply Agreement. Additionally, under the Change in Control, we received \$1.3 million in advance of revenue to be recognized in future periods related to Specific Capital.

We believe the Supply Agreement will continue to provide material incremental sales volume and lower fixed operating costs on a per unit basis for our manufacturing plant located in Louisiana (the "Red River Plant"). Further, the Supply Agreement has expanded distribution of our AC products to additional markets outside of those we have traditionally served.

Competition

Our primary competitors for consumable sorbent products include Norit, owned by One Equity Partners, Calgon Carbon, a subsidiary of Tokyo Stock Exchange listed Kuraray Co., Ltd. and Donau Carbon Company. Our primary competitors for consumable chemical products include Midwest Energy Emissions Corp. (MEEC) and Nalco Holding Company, a subsidiary of Ecolab Inc. (ECL).

Raw Materials

The principal raw material we use in the manufacturing of AC is lignite coal, which is readily available. We source 100% of the lignite coal to fulfill customer orders through our ownership of the Five Forks Mine ("Five Forks"). Five Forks is operated for us by a subsidiary of the North American Coal Company. We may also periodically purchase various ACs to supplement our inventory levels or to produce various products to serve certain AC markets. We purchase these various ACs through supply agreements or spot purchases with the producers.

We purchase various additives utilized in the production of AC. The manufacturing of AC is dependent upon these various additives, which are subject to price fluctuations and supply constraints. In addition, the number of suppliers who provide the necessary additives needed to manufacture our ACs is limited. We purchase these additives through supply agreements or spot purchases with the producers. Supply agreements with these producers are generally renewed on an annual basis.

We also purchase additives that are included in certain chemical products for resale to our customers through contracts with suppliers. The manufacturing of these consumable products is dependent upon certain discrete additives, which are subject to price fluctuations and supply constraints. In addition, the number of suppliers who provide the necessary additives needed to manufacture our chemical products are limited. We purchase these chemical products through spot purchases with the producers.

Due to the nature of our business and the marketplace we operate in, there is an ebb and flow in demand for our product and consequently, our inventory levels may vary throughout the year. Across our business, there is at times a need to supplement the available production at our Red River Plant to meet an increase in overall demand for our AC products. For example, for the year ended December 31, 2021, we observed significant increases in demand for our AC products that exceeded our available inventory and production capacity. As a result, we purchased third party products during 2021 and 2022 to supplement our current inventory and to increase our inventory balances to meet customer requirements. As demand for our product increases, we will increase our production, if available to do so, and, as necessary, continue to purchase additional inventory from third parties to meet our customer obligations.

Operations

We own and operate the Red River plant, which is located in Louisiana. We also lease land on which we operate a production and distribution facility located in Louisiana. Additionally, we have sales, product development and administrative operations located in Colorado.

In 2020 and in conjunction with the execution of the Supply Agreement, we purchased 100% of the membership interests in Marshall Mine, LLC, which owns a lignite mine located outside of Marshall, Texas (the "Marshall Mine"). We concluded that the Marshall Mine did not have any remaining economic reserves and independently determined to immediately commence activities to shutter it. Accordingly, on September 30, 2020, we entered into a reclamation contract with a third party for the full reclamation of the Marshall Mine. In September 2022, we entered into an agreement with a third-party to sell all membership interests in Marshall Mine, LLC. The obligations of the parties to close the sale transaction are subject to certain events, including (1) obtaining the approval of the Railroad Commission of Texas for an operating permit in the name of the buyer or an affiliate of the buyer, and (2) replacing our surety bond with a reclamation performance bond, letter of credit or other form of security to which the buyer or an affiliate of the buyer is the principal that is satisfactory to the Railroad Commission of Texas. We currently expect to close the sale transaction of the Marshall Mine during the first half of 2023.

Research and Development Activities

We have conducted research and product development related to the customers and market that we currently serve or are pursuing. During the years ended December 31, 2022 and 2021, we incurred research and development costs of \$0.4 million and \$0.4 million, respectively.

Legislation and Environmental Regulations

Our products and services are used for the reduction of pollutants and other contaminants. Legislation and regulation limit the amount of pollutants and other contaminants permitted and may increase the need for our product. Below is a summary of the primary legislation and regulation that currently affects the market for our current products.

Federal MATS Affecting Electric Utility Steam Generating Units

The U.S. Environmental Protection Agency (the "EPA") final "MATS Rule" went into effect in April 2012. The EPA structured the MATS Rule as a Maximum Achievable Control Technology-based ("MACT-based") hazardous pollutant regulation applicable to coal and oil-fired Electric Utility Steam Generating Units ("EGU"), which generate electricity through steam turbines and have a capacity of 25 megawatts or greater, and provide for, among other provisions, control of mercury, control of acid gases such as hydrochloric acid and other Hazardous Air Pollutants ("HAPs"). Approximately 1,260 units in the U.S. were coal-fired EGUs when the rule was enacted. According to our estimates, the MATS Rule sets a limit that we believe requires the capture of 80-90% plus of the mercury in the coal burned in electric power generation boilers as measured at the exhaust stack outlet for most plants. The MACT-based standards are also known as National Emission Standards for Hazardous Air Pollutants ("NESHAP"). Plants generally had four years to comply with the MATS Rule, and implementation of the MATS Rule is now largely completed. We estimate that 52% of the coal-fired units that were operating in December 2012 when the MATS Rule was finalized have been permanently shut down, leaving approximately 469 units in operation in the U.S. as of December 31, 2022.

In April 2017, a review by the U.S. Court of Appeals for the D.C. Circuit (the "D.C. Circuit") of a 2016 'supplemental finding' associated with the cost benefit analysis of the MATS Rule conducted by the EPA was stayed at the request of the Trump Administration. The court case continues to be stayed indefinitely. In May 2020, the EPA reconsidered and withdrew its 2016 "supplemental finding" associated with the cost benefit analysis of the MATS Rule. In this action, the EPA found that it was not "appropriate and necessary" to regulate HAPs emissions from coal- and oil-fired EGUs. However, the EPA expressly stated that the reconsideration neither removed coal- and oil-fired EGUs from the list of sources that must comply with the MATS rule, nor rescinded the MATS Rule, which has remained continuously in effect. ADES joined a number of parties in seeking review of this EPA action before the D.C. Circuit. President Biden identified the EPA's withdrawal of the supplemental finding as one of the actions to be reviewed for conformity with Biden Administration policy, and in February 2021, the Biden Administration moved that the pending judicial review of the supplemental finding withdrawal be held in abeyance. On February 9, 2022, the EPA published a new proposed rule revoking the May 2020 withdrawal of the 2016 supplemental finding and affirming that it is "appropriate and necessary" to regulate HAP emissions from coal- and oil-fired EGUs, which is currently pending. The D.C. Circuit granted the Biden Administration's motion, and this appeal also is now in abeyance. The MATS Rule remains in effect.

State Mercury and Air Toxics Regulations Affecting EGUs

In addition, certain states have their own mercury rules that are similar to or more stringent than the MATS Rule. Coal-fired electricity generating units in the U.S are subject to consent decrees that require the control of acid gases and particulate matter, in addition to mercury emissions.

U.S. Federal Industrial Boiler MACT

In January 2013, the EPA issued the final set of adjustments to the MACT-based air toxics standards for industrial boilers, including mercury, particulate matter and acid gas emission limits. Existing boilers typically had until January 31, 2017 to comply with the rule. On December 1, 2014, the EPA announced the reconsideration of the industrial boiler MACT ("IBMACT") and proposed amendments to the version published January 31, 2013, representing technical corrections and clarifications. The proposed amendments do not affect the applicability of the final rule.

The EPA estimated that approximately 600 coal-fired boilers will be affected by IBMACT, in industries such as pulp and paper. Our estimates, based on conversations with plant operators, suggest that most of the affected plants have either shut down or switched fuels to natural gas to comply with the regulation.

Effluent Limitation Guidelines

In 2015, the EPA set the first federal limits known as effluent limitation guidelines ("ELGs") on the levels of toxic metals in wastewater that can be discharged from power plants. The final rule requires, among other things, zero discharge for fly ash and bottom ash transport water, and limits on mercury, arsenic, selenium, and nitrate from flue gas desulfurization ("FGD") wastewater. In September 2017, the EPA finalized a rule that delayed the original compliance deadlines for certain wastewater streams from November 2018 to November 2020, with the possibility that plants would not need to comply until December 2023 with state approval. In April 2019, the U.S. Court of Appeals for the Fifth Circuit struck down the EPA's ELGs that apply to leachate wastewater and "legacy wastewater," and directed the EPA to revise the limits on the levels of toxic metals in those wastewater streams. In November 2019, the EPA proposed to revise the ELGs for bottom ash and FGD wastewater. The final rule, published in the Federal Register on October 13, 2020 and effective on December 14, 2020, does not directly regulate halogens. It does, however, propose to establish a voluntary incentives program for the removal of certain halides. In many (though not all) of the proposed treatment options that the EPA is considering, selenium in FGD wastewater would be regulated. Some halogens may impact the effectiveness of biological wastewater treatment systems that are often used for the removal of selenium. On August 3, 2021, the EPA initiated a supplemental rule-making initiative to strengthen certain discharge limits and stated its intention to issue a proposed rule for public comment in Fall of 2022, which has not yet been issued.

Additional U.S. Legislation and Regulations

In 2015, the EPA finalized rules to reduce greenhouse gases ("GHGs") in the form of the Clean Power Plan ("CPP"), which established guidelines for states to follow in developing plans to reduce GHG emissions from fossil fuel-fired power plants. Under the CPP, states were required to prepare "State Plans" to meet state targets based on emission reductions from affected sources. The CPP was challenged by multiple states in the D.C. Circuit. The CPP was stayed by the U.S. Supreme Court. The D.C. Circuit held the CPP litigation in abeyance until April 28, 2017, and dismissed the case once the EPA repealed the CPP in July 2019.

The EPA repealed the CPP and replaced it with the Affordable Clean Energy ("ACE") rule, which established guidelines for states to follow in developing plans to reduce GHG emissions from fossil fuel-fired power plants. ACE also requires states to prepare State Plans and prescribes that they must be based on heat rate improvements at affected plants. Numerous states, power companies and non-governmental organizations challenged the ACE rule in the D.C. Circuit, which vacated the ACE rule on January 19, 2021. On February 12, 2021, EPA stated that neither the ACE or CPP regulations were in place with respect to GHGs for fossil fuel-fired power plants.

International Regulations

There are various international regulations related to mercury control. In Canada, the Canada-Wide Standard ("CWS") was initially implemented in 2010, with increasingly stringent limits through 2020 and varying mercury emissions caps for each province. China and Germany both have limits for mercury emissions that are less stringent than U.S. limits and are typically met using co-benefits from other installed air pollution control equipment designed to control other pollutants. In May 2017, the EU ratified the Minamata Convention on Mercury, triggering mercury control regulations with implementation starting in 2021. Specific emissions limits for dust, nitrogen oxides (NO_x), sulfur dioxide (SO₂), mercury and particulate matter (PM) are currently being developed guided by the best available technologies reference ("BREF") document for limiting stack emissions and liquid effluents from industrial processes. The BREF conclusions for large coal-fired electricity generating units were adopted by the European Commission in July 2017.

Based on the existing and potential regulations, we believe the international market for mercury control products may expand in the coming years.

Mining Environmental and Reclamation Matters

Federal, state and local authorities regulate the U.S. coal mining industry with respect to matters such as employee health and safety and the environment, including the protection of air quality, water quality, wetlands, special status species of plants and animals, land uses, cultural and historic properties and other environmental resources identified during the permitting process. Reclamation is required during production and after mining has been completed. Materials used and generated by mining operations must also be managed according to applicable regulations and law.

The Surface Mining Control and Reclamation Act of 1977 ("SMCRA"), establishes mining, environmental protection, reclamation and closure standards for all aspects of surface mining. Mining operators must obtain SMCRA permits and permit renewals from the Office of Surface Mining (the "OSM") or from the applicable state agency if the state agency has obtained regulatory primacy. A state agency may achieve primacy if the state regulatory agency develops a mining regulatory program that is no less stringent than the federal mining regulatory program under SMCRA. The Five Forks Mine operates in Louisiana, which has achieved primacy and issues permits in lieu of the OSM. The Marshall Mine operates in Texas, which has also achieved primacy and issues permits in lieu of the OSM.

Mine operators are often required by federal and/or state laws, including SMCRA, to assure, usually through the use of surety bonds, payment of certain long-term obligations including mine closure or reclamation costs, federal and state workers' compensation costs, coal leases and other miscellaneous obligations. Although surety bonds are usually noncancelable during their term, many of these bonds are renewable on an annual basis and collateral requirements may change. As of December 31, 2022, we posted a surety bond of approximately \$7.5 million for reclamation of the Five Forks Mine and \$16.6 million for the reclamation of Marshall Mine.

Patents

As of December 31, 2022, we held 86 U.S. patents and 12 international patents that were issued or allowed, 13 additional U.S. provisional patents or applications that were pending, and two international patent applications that were either pending or filed relating to different aspects of our technology. Our existing patents generally have terms of 20 years from the effective date of filing, with our next patents expiring in 2024.

Seasonality of Activities

The sale of our consumable products depends on the operations of the power generation units, industrial facilities and water treatment plants in which the applicable consumables are provided. Power generation is weather dependent, with electricity and steam production varying in response to heating and cooling needs. Additionally, power generating units routinely schedule maintenance outages in the spring and/or fall depending on the operation of the boilers. During the period in which an outage may occur, which may range from one week to over a month, no consumables are used, and our sales may be correspondingly reduced.

The sale of our AC products for water purification depends on demand from municipal water treatment facilities that use these products. Depending on weather conditions and other environmental factors, the summer months historically have the highest demand for PAC, as one of the major uses for PAC is for the treatment of taste and odor episodes caused by increased degradation of organic contaminants and natural materials in water during the summer. Additionally, the rainy season causes more PAC usage for the municipalities due to rain run-offs and contaminant dilution resulting in higher water treatment volumes.

Safety, Health and Environment

Our operations are subject to numerous federal, state, and local laws, regulations, rules and ordinances relating to safety, health, and environmental matters ("SH&E Regulations"). These SH&E Regulations include requirements to maintain and comply with various environmental permits related to the operation of many of our facilities, including mine health and safety laws required for continued operation of the Five Forks Mine.

Employees

As of December 31, 2022, we employed 147 personnel, 28 in Colorado and 119 in Louisiana, all of which were employed full-time.

Entry into Material Definitive Agreements

Securities Purchase Agreement

On February 1, 2023 (the "Acquisition Date"), we entered into a Securities Purchase Agreement (the "Purchase Agreement") with Arq Limited ("Arq Ltd."), a company incorporated under the laws of Jersey, pursuant to which we acquired all of the direct and indirect equity interests of Arq Ltd.'s subsidiaries (the "Arq Acquisition," and hereafter referred to as "Arq") in exchange for consideration (the "Purchase Consideration") totaling \$31.2 million and consisting of (i) 3,814,864 shares of the Company's common stock, par value \$0.001 per share (the "Common Stock"), valued at \$12.4 million and (ii) 5,294,462 shares of the Company's Series A Convertible Preferred Stock, par value \$0.001 per share (the "Series A Preferred Stock"), valued at \$18.8 million.

In connection with the issuance of the Series A Preferred Stock pursuant to the Purchase Agreement, we filed the Certificate of Designations of Preferred Stock for the Series A Preferred Stock (the "Certificate of Designations") with the Secretary of State of the State of Delaware. Capitalized terms used herein but not otherwise defined have the meaning set forth in the Purchase Agreement. The Purchase Agreement contains customary representations, warranties and covenants. The Arq Acquisition closed concurrently with execution of the Purchase Agreement.

Under the terms of the Purchase Agreement, 833,914 shares of the Series A Preferred stock issued to Arq Ltd. are being held in escrow (the "Escrow Shares") pending a determination by the Internal Revenue Service (the "IRS") that no tax withholding is required on the Purchase Consideration issued to Arq Ltd. (the "Arq Ltd. Tax Liability"). We have estimated the fair value of the potential Arq Ltd. Tax Liability at \$3.3 million.

We accounted for the Arq Acquisition as an acquisition of a business as of the Acquisition Date. The total Purchase Consideration was \$31.2 million and has been preliminarily allocated to the acquired assets and assumed liabilities of Arq based on their estimated fair values as of the Acquisition Date.

Arq's principal office is located in London, United Kingdom, with additional offices located in Lexington and Corbin, Kentucky near its main production facility. Arq is an environmental technology company that has developed a process for transforming coal waste into a purified, microfine carbon powder, known as Arq powderTM ("Arq Powder"), which can be used as an alternative to oil or in-ground mined coal to produce a range of noncombustible and combustible carbon-rich products. With the completion of the Arq Acquisition, we intend to utilize Arq Powder as a feedstock to produce high-quality AC for use in water and air purification markets as well as sell Arq Powder as an additive into other markets.

Series A Preferred Stock

Each share of Series A Preferred Stock will be automatically converted into a share of Common Stock upon approval by the holders of the percentage of Common Stock required to approve such conversion under the applicable rules of The Nasdaq Stock Market ("Nasdaq"), without the need for any action on the part of the holders of Series A Preferred Stock (the "Conversion Approval"). Each share of Series A Preferred Stock is deemed to have an original issue price of \$4.00 per share (the "Original Issue Amount"). The number of shares of Common Stock issued upon conversion of each share of Series A Preferred Stock shall be equal to the product of (i) the sum of (A) the Original Issue Amount plus (B) an amount equal to the cumulative amount of the accrued and unpaid dividends on such share at such time (regardless of whether or not declared or funds for their payment are lawfully available) divided by (ii) the Original Issue Amount, subject to adjustment as provided in the Certificate of Designations.

Holders of the Series A Preferred Stock are entitled to receive cumulative dividends which will accrue quarterly on the last day of each applicable quarter (whether or not declared or funds for their payment are lawfully available) and will be payable quarterly, in arrears, on the earlier to occur of (a) the date any dividend is paid to holders of Common Stock with respect to such quarter and (b) 30 days after the end of each quarter (the "Series A Quarterly Dividend") at the rate per share of Series A Preferred Stock equal to the greater of (i) if we declare a cash dividend on the Common Stock with respect to such quarter, the amount of the cash dividend that would be received by a holder of Common Stock in which such share of Series A Preferred Stock would be convertible on the record date for such cash dividend and (ii) an annual rate (the "Rate") of 8.0% of the Original Issue Amount per annum compounded quarterly (the "Coupon Dividend") with respect to such quarter. The Rate will increase by 2.0% on the first day of the first quarter ending on or after the 635th day following the closing date of the first issuance of Series A Preferred Stock and on each subsequent anniversary of such date.

The Series A Quarterly Dividend is payable in cash or in additional shares of Series A Preferred Stock (the "Series A PIK Shares"), at the Company's option. The number of Series A PIK Shares to be issued shall be determined by dividing (i) the Series A Quarterly Dividend payable with respect to all shares of Series A Preferred Stock held by a holder thereof by (ii) the aggregate Original Issue Amount of all shares of Series A Preferred Stock held by a holder thereof, and each fractional Series A PIK Share will be rounded to the nearest whole Series A PIK Share (with 0.5 of a share being rounded down to 0.0).

In the event of our liquidation, dissolution or winding up, after payment or provision for payment of our debt and other liabilities, a holder of Series A Preferred Stock will receive a liquidating distribution equal to the amount of the cumulative accrued but unpaid dividends on each share of Series A Preferred Stock held by such holder. After the payment to the holders of Series A Preferred Stock of such liquidation preference, the holders of outstanding shares of Series A Preferred Stock will participate *pari passu* with the holders of Common Stock on an as-converted basis in any remaining distributions out of the Company's assets available for distribution to stockholders.

Holders of shares of Series A Preferred Stock will generally have no voting rights. However, we are restricted from taking certain actions without the written consent or affirmative vote of the holders of at least a majority of the then outstanding shares of Series A Preferred Stock, including, but not limited to, consummating a merger with or into another party or a sale of substantially all of our assets; issuing Common Stock or instruments convertible into Common Stock representing more than 20% of our outstanding share capital to the extent the applicable issuance requires approval of holders of Common Stock pursuant to applicable law or the rules of the applicable stock exchange on which the Common Stock is listed; or authorizing, creating or issuing any Senior Stock or Parity Stock (each as defined in the Certificate of Designations) of the Company (or amending the provisions of any existing class of securities to make such class of securities Senior Stock or Parity Stock). In addition, we are restricted from amending our Certificate of Incorporation or Bylaws in a manner that adversely affects the rights of the Series A Preferred Stock without the written consent or affirmative vote of the holders of at least 75% of the then outstanding shares of Series A Preferred Stock.

If the Conversion Approval has not been obtained prior, each outstanding share of Series A Preferred Stock will be redeemed by us on February 1, 2028 for cash, at a redemption price equal to the sum of (i) the product of (x) 140% and (y) the Original Issue Amount, plus (ii) an amount equal to the cumulative amount of accrued and unpaid dividends on such share of Series A Preferred Stock.

Subscription Agreements

Also, on February 1, 2023, we entered into Subscription Agreements (the "Subscription Agreements") with certain persons (the "Subscribers") pursuant to which the Subscribers subscribed for and purchased shares of Common Stock for an aggregate purchase price of approximately \$15.4 million and at a price per share of \$4.00 (the "PIPE Price Per Share" and such transaction, the "PIPE Investment"). The securities issued to the Subscribers under the Subscription Agreements were issued pursuant to an exemption from registration under Section 4(a)(2) of the Securities Act of 1933, as amended (the "Securities Act"), Rule 506 of Regulation D, which is promulgated thereunder, and Regulations S of the Securities Act. ADES and its affiliates relied on this exemption from registration based in part on representations made by each of the Subscribers under the Subscription Agreements.

As a requirement of the Arq Acquisition, we appointed three new directors to our Board of Directors (the "New Directors"), each of whom was a director of Arq Ltd, and is considered a related party as of the Acquisition Date. Each of the New Directors individually and/or through their affiliated entities were Subscribers in the PIPE Investment.

Registration Rights Agreement

Pursuant to the terms of the Purchase Agreement, we entered into a Registration Rights Agreement (the "Registration Rights Agreement") with Arq and the Subscribers to the Subscription Agreements described above. The Registration Rights Agreement provides that as promptly as practicable following the closing of the Arq Acquisition, but no later than 150 days after the Acquisition Date, ADES will file a registration statement registering the resale of the shares of Common Stock received by Arq Ltd. as Purchase Consideration and the Subscribers in the PIPE Investment (including shares of Common Stock issued upon conversion of the Series A Preferred Stock). ADES will also use commercially reasonable efforts to have such registration statement declared effective as soon as practicable following the filing thereof, but no later than the earlier of (i) the 210th calendar day (or 270th calendar day if the U.S. Securities and Exchange Commission (the "SEC") gives notice that it will review the registration statement) following the filing thereof and (ii) the 10th business day after the date the SEC gives notice that it will not review the registration statement, subject to certain conditions. The Registration Rights Agreement further provides that certain of the investors party thereto will be entitled to customary "piggyback" registration rights.

Loan Agreement

On August 19, 2022, ADES and CF Global Credit, LP ("CF Global") executed a commitment letter pursuant to which CF Global offered to provide a \$10.0 million term loan (the "Term Loan") to us. The proceeds of the Term Loan are intended to be utilized for the general corporate purposes of ADES and its subsidiaries.

On February 1, 2023 (the "Closing Date"), ADES, as borrower, certain of its subsidiaries, as guarantors, and CF Global, as administrative agent and lender, entered into the Term Loan upon execution of a Term Loan and Security Agreement (the "Loan Agreement"). Capitalized terms used herein but not otherwise defined have the meaning set forth in the Loan Agreement.

The Term Loan has a term of 48 months and bears interest at a rate equal to either (a) Adjusted Term SOFR (subject to a 1.00% floor and a 2.00% cap) plus a margin of 9.00% paid in cash and 5.00% paid in kind or (b) Base Rate plus a margin of 8.00% paid in cash and 5.00% paid in kind, which interest on the Term Loan in each case shall be payable (or capitalized, in the case of in kind interest) quarterly in arrears.

We are permitted to prepay the Term Loan at any time subject to the following prepayment premium: (i) prior to the twelve (12) month anniversary of the Closing Date, the Make-Whole Amount (as defined below), (ii) thereafter but prior to the thirty-six (36) month anniversary of the Closing Date, 2.00% of the outstanding principal amount of the Term Loan being repaid or prepaid or (iii) thereafter until the maturity date, 1.00% of the outstanding principal amount of the Term Loan being repaid or prepaid. The "Make-Whole Amount", with respect to any repayment or prepayment, is (i) an amount equal to all required interest payable (except for currently accrued and unpaid interest) on the aggregate principal amount of the Term Loan subject to such prepayment or repayment from the date of such prepayment or repayment through but excluding the date that is the first anniversary of the Closing Date calculated using an interest rate equal to (x) Adjusted Term SOFR for an interest period of one month in effect on the third U.S. Government Securities Business Day prior to such prepayment or repayment plus (y) 14.00% per annum and assuming all interest was paid in cash, plus (ii) a prepayment premium of 2.00% on the aggregate principal amount of the Term Loan subject to such prepayment or repayment.

The Term Loan is secured by substantially all of the assets of ADES and its subsidiaries, excluding those subsidiaries described in the agreement, subject to customary exceptions.

The Loan Agreement includes, among others, the following covenants: (1) beginning March 31, 2023 and as of the end of each fiscal quarter thereafter, ADES must maintain a minimum cash balance of \$5.0 million; (2) (x) as of December 31, 2023, for the fiscal year then ended, ADES must have a minimum annual revenue, on a consolidated basis, of \$70.0 million, (y) as of December 31, 2024, for the fiscal year then ended, ADES must have a minimum annual revenue, on a consolidated basis, of \$85.0 million and (z) for any fiscal year thereafter, ADES must have a minimum annual revenue, on a consolidated basis, of \$100.0 million; (3) (x) as of December 31, 2024, for the fiscal year then ended, ADES must have a minimum EBITDA of \$3.0 million and (y) for any fiscal year thereafter, ADES must have a minimum EBITDA of \$16.0 million; and (4) beginning after the fiscal quarter ending September 30, 2023, during an LTV Trigger Period, ADES must not exceed a loan to value ratio (based on the consolidated total assets of ADES and its subsidiaries) of 0.40:1.00.

In addition, in connection with the Loan Agreement and as consideration for the Term Loan, ADES agreed to issue to CF Global a warrant (the "Warrant") to purchase 325,457 shares of Common Stock. The Warrant has an exercise price of \$0.01 per share, subject to adjustment as set forth in the Warrant, is exercisable immediately and will expire on February 1, 2030. The terms of the Warrant do not allow for cash exercise, and the Warrant may only be exercised pursuant to the terms thereof. The Warrant was issued without registration under the Securities Act in reliance on the exemptions provided by Section 4(a)(2) of the Securities Act as transactions not involving a public offering and Rule 506 promulgated under the Securities Act as sales to accredited investors.

One of the New Directors is a principal of CF Global and both this director and CF Global are considered related parties as of the Acquisition Date.

Termination of Transaction Agreement

In connection with entry into the Purchase Agreement described above, that certain Transaction Agreement, dated August 19, 2022, by and among Elbert Holdings, Inc., Arq and ADES (the "Transaction Agreement") was terminated on February 1, 2023 pursuant to a termination agreement entered into by each of the parties to the Transaction Agreement. The Transaction Agreement would have provided, subject to its terms and conditions, for a business combination of Arq Ltd. and ADES. By virtue of the termination of the Transaction Agreement, the Transaction Agreement became void and of no further force or effect, with no liability of any party to the Transaction Agreement.

Arq Business

Overview

Arq is an environmental technology company that has developed a process for transforming coal waste into a purified, microfine carbon powder, known as Arq Powder, which can be used as an alternative to oil or in-ground mined coal to produce a range of carbon products or as a feedstock for AC. Additionally, Arq has developed a portfolio of additional product opportunities that include using Arq Powder as a component for asphalt, carbon black and power generation, that can achieve similar advantages in other large markets.

Arq has constructed a production facility at a large coal waste site in Corbin, Kentucky (the "Corbin Facility"). Arq processes coal mining waste and applies patented technology to produce Arq Powder, which has applications in a broad range of carbon products. Arq Powder has unique properties, including low levels of impurities and small average particle size, which when used as a feedstock to produce certain carbon products may provide for advantages compared to coal or oil-based feedstocks in terms of cost and performance.

Arq Powder is in development stage, and we do not expect it to be commercially sold until 2024 due to ongoing capital projects to improve the operating capabilities of the Corbin Facility. We believe the Arq Powder technology has several key environmental benefits: (1) it enables the remediation of waste land, (2) it displaces native coal production while producing valuable products, and (3) it may also have a lower environmental impact than conventional alternatives because Arq Powder is derived from reclaimed waste.

Strategy

We intend to first sell Arq Powder as a carbon filler for rubber composites and as a component for asphalt with an opportunity to evaluate expanding into other carbon products. These products utilizing Arq Powder are expected to have a lower carbon footprint compared to similar products utilizing conventional materials. These options are currently in various stages of proof of concept testing or customer testing.

As we complete capital upgrades to the Red River Plant, we intend to use Arq Powder as a bituminous based feedstock to produce high-quality AC for use in various markets.

Through internal testing, we have demonstrated that Arq Powder can be shaped and successfully activated using industrially available equipment, technology, and know-how. In the U.S, the availability of feedstock for GAC manufacturing is limited as it is either supplied by specialty mined coal or coconut husks which need to be imported.

We believe Arq Powder has the potential to open markets and applications for us, which were previously inaccessible to the lignite-based products made by ADES today. In addition, the Arq Acquisition enables us to have a fully integrated supply chain in multiple feedstocks - bituminous (Arq) and lignite (through the Five Forks Mine) to produce GAC and PAC.

Arq's Intellectual Property

Arq has 21 U.S. and foreign patents issued, with 63 pending patent applications. Arq's issued patents and pending patent applications span a variety of products and processes, including: fuel oil composition containing solid hydrocarbonaceous and carbonaceous particles; processes for fractionated product from crude oil containing solid hydrocarbonaceous particles; road asphalt feedstock; AC feedstock; anode binder pitch feedstock; needle coke feedstock; delayed coker feedstock; battery graphite feedstock; purified coal product process; and process for blending purified coal products with oils, including bio-components.

Arq also enforces its intellectual property across trademark, copyright, and trade secret matters to protect its intellectual property.

Available Information

Our periodic and current reports are filed with the Securities and Exchange Commission (the "SEC") pursuant to Section 13(a) of the Securities Exchange Act of 1934, as amended (the "Exchange Act") and are available free of charge within 24 hours after they are filed with, or furnished to, the SEC at the Company's website at www.advancedemissionsolutions.com. The filings are also available through the SEC at the SEC's Public Reference Room at 100 F Street, N.E., Washington, D.C. 20549 or by calling 1-800-SEC-0330. Alternatively, these reports can be accessed at the SEC's website at www.sec.gov. The information contained on our website shall not be deemed incorporated by reference in any filing under the Securities Act of 1933, as amended (the "Securities Act") or the Exchange Act.

Forward-Looking Statements Found in this Report

This Report contains forward-looking statements within the meaning of Section 27A of the Securities Act and Section 21E of the Exchange Act that involve risks and uncertainties. In particular such forward-looking statements are found in this Part I and under the heading in Part II, Item 7 below. Words or phrases such as "anticipates," "believes," "expects," "intends," "plans," "estimates," "predicts," the negative expressions of such words, or similar expressions are used in this Report to identify forward-looking statements, and such forward-looking statements include, but are not limited to, statements or expectations regarding:

- (a) the anticipated effects from an increase in pricing of our AC products;
- (b) the anticipated effects from an increase in costs of our AC products and related cost increases in supply and logistics;
- (c) expected supply and demand for our AC products and services;
- (d) increasing competition in the AC market;
- (e) the effects of the Arq Acquisition;
- (f) the ability to successfully integrate Arq's business;
- (g) the ability to develop and utilize Arq's products and technology;
- (h) the ability to make Arq's products commercially viable;
- (i) the expected future demand of Arq's products;
- (j) future level of research and development activities;
- (k) future plant capacity expansions and site development projects;
- (l) the effectiveness of our technologies and the benefits they provide;
- (m) probability of any loss occurring with respect to certain guarantees made by Tinnuum Group;
- (n) the timing of awards of, and work and related testing under, our contracts and agreements and their value;
- (o) the timing and amounts of or changes in future revenues, backlog, funding for our business and projects, margins, expenses, earnings, tax rates, cash flows, royalty payment obligations, working capital, liquidity and other financial and accounting measures;
- (p) the amount of future capital expenditures needed for our business and needed by Arq to fund its business plan;
- (q) awards of patents designed to protect our proprietary technologies both in the U.S. and other countries;
- (r) the adoption and scope of regulations to control certain chemicals in drinking water and other environmental concerns;
- (s) the impact of adverse global macroeconomic conditions, including rising interest rates, recession fears and inflationary pressures, and geopolitical events or conflicts; and
- (t) opportunities to effectively provide solutions to U.S. coal-related businesses to comply with regulations, improve efficiency, lower costs and maintain reliability.

Our expectations are based on certain assumptions, including without limitation, that:

- (a) coal will continue to be a significant source of fuel for electrical generation in the U.S.;
- (b) we will continue as a key supplier of consumables to the coal-fired power generation industry as it seeks to implement reduction of mercury emissions;
- (c) we will be able to obtain adequate capital and personnel resources to meet our operating needs and to fund anticipated growth and our indemnity obligations;
- (d) Norit will continue to purchase Furnace Products from us under the Supply Agreement in the quantities specified;
- (e) we will be able to establish and retain key business relationships with current and other companies;
- (f) orders we anticipate receiving will be received;

- (g) we will be able to formulate new consumables that will be useful to, and accepted by, the markets;
- (h) we will be able to effectively compete against others; and
- (i) we will be able to meet any technical requirements of projects we undertake.

The forward-looking statements included in this Report involve risks and uncertainties. Actual events or results could differ materially from those discussed in the forward-looking statements as a result of various factors including, but not limited to, timing of new and pending regulations and any legal challenges to or extensions of compliance dates of them; the U.S. government's failure to promulgate regulations that benefit our business; changes in laws and regulations, accounting rules, prices, economic conditions and market demand; impact of competition; availability, cost of and demand for alternative energy sources and other technologies; technical, start up and operational difficulties; our inability to commercialize our APT technologies on favorable terms; our inability to ramp up our operations to effectively address recent and expected growth in our business; loss of key personnel; availability of materials and equipment for our business; intellectual property infringement claims from third parties; pending litigation; as well as other factors relating to our business strategy, goals and expectations concerning the Arq Acquisition (including future operations, future performance or results); the effect of the Arq Acquisition on our ability to hire key personnel; our ability to maintain relationships with customers, suppliers and other with whom we do business, or our results of operations and business generally; risks related to diverting management's attention from our ongoing business operations; the ability to meet Nasdaq's listing standards following the consummation of the Arq Acquisition; costs related to the Arq Acquisition; opportunities for additional sales of our lignite AC products and end-market diversification; our ability to meet customer supply requirements; the rate of coal-fired power generation in the U.S., as described in our filings with the SEC, with particular emphasis on the risk factor disclosures contained in those filings. You are cautioned not to place undue reliance on the forward-looking statements made in this Report and to consult filings we have made and will make with the SEC for additional discussion concerning risks and uncertainties that may apply to our business and the ownership of our securities. The forward-looking statements contained in this Report are presented as of the date hereof, and we disclaim any duty to update such statements unless required by law to do so.

Item 1A. Risk Factors

The following risks relate to us as of the date this Report is filed with the SEC. This list of risks is not intended to be exhaustive, but reflects what we believe are the material risks inherent in our business and the ownership of our securities as of the specified dates. A statement to the effect that the occurrence of a specified event may have a negative impact on our business, results of operations, profitability, financial condition, or the like, is intended to reflect the fact that such an event, if it occurs, would be likely to have a negative impact on your investment in ADES, but should not imply the likelihood of the occurrence of such specified event. The order in which the following risk factors are presented is not intended as an indication of the relative seriousness of any given risk.

Risks Related to Our Business

We are solely dependent on earnings from our consumables products to fund our operations and need to substantially grow earnings from the APT business. Future distributions from Tinum Group and Tinum Services will be insignificant.

The Section 45 tax credit period expired on December 31, 2021. As a result, both Tinum Group and Tinum Services have substantially ceased operations and we received distributions from each through December 2022. We expect to receive limited distributions from each in 2023.

From an earnings standpoint, our business must grow substantially, either organically or through acquisition. There can be no assurance that we will be able to increase our earnings in 2023 and beyond to cover our current operating expenses or to provide a return to shareholders that is comparable to the return that we previously provided while Tinum Group and Tinum Services were operating. We do not expect our overall selling, general and administrative portions of our operating expenses to materially decrease in 2023. If we are not able to cover operating expenses, we could be forced to raise additional capital, significantly reduce our operating expenses or take other alternative actions.

Our future financial results will suffer if we do not effectively manage our expanded operations following the Arq Acquisition.

Following the Arq Acquisition, the size of our business has increased. Our future results depend, in part, upon our ability to manage this expanded business, which will pose substantial challenges for management, including challenges related to the management and monitoring of new operations and associated increased costs and complexity. There can be no assurance that we will be successful or that we will realize the expected operating efficiencies, cost savings, revenue enhancements and other benefits currently anticipated from the Arq Acquisition.

The Arq Acquisition will require significant capital for us to manufacture Arq's products.

Arq is a development stage entity that to date has not generated any revenues. Arq has historically had net losses and required multiple financing rounds to fund its business plan. We will require significant capital to execute our business plan in order to manufacture Arq's products. A significant funding source will be our cash on hand. Our capital expenditure requirements include improvements and enhancements at the Red River Plant and Corbin Facility. Going forward there may be additional capital expenditure requirements for the expansion of capacity at the Red River Plant and Corbin Facility. We may not be successful in obtaining the required financing or, if financing is available to us, such financing may not be on terms that are favorable to us. The failure to obtain financing as necessary to fund future capital expenditure requirements could result in the delay of the expansion of the Red River Plant and Corbin Facility and other manufacturing facilities.

The Arq Acquisition will require significant technological changes in manufacturing that may adversely affect the market acceptance of Arq's products.

We will be producing new products that we have not yet sold commercially. As such, production to date has not been at full throughput. Arq's new manufacturing technology has been extensively tested at scale, but continuous operations represent risks including an inability to achieve the scale-up efficiencies which have been assumed in our business plan. In turn, this could impact throughput in the Corbin Facility, which could lead to lower production and higher operating costs. There is also risk of delays that are product-specific. For example, we may not receive adequate customer acceptance or achieve acceptable performance given the specification differentiation between some of Arq's products and the industry's existing conventional products. These risks could have a material adverse effect on our business, operating results and financial condition.

There could be no future demand for Arq's products.

Our primary market for Arq Powder will be as a feedstock for AC, and although we believe current conditions are favorable as a result of excess demand versus supply, there can be no guarantee that this will continue. Drivers of demand include factors beyond our control such as population growth and GDP growth, amongst others. Any major global downturn could also materially negatively impact this demand. New activated carbon supply is driven by new manufacturing sites being built, and we have little visibility on what additional manufacturing capacity other manufacturers may add in the future. Arq's business plan also assumes entry into new markets including additives for carbon black and asphalt. Although testing data and feedback from potential customers have been positive to date, Arq has had no sales of its products and there can be no assurance that these products will be commercially viable.

Our commercial success will depend on our ability to sell Arq Powder into new markets, including as an additive into the carbon black and asphalt markets. As we attempt to develop and grow Arq Powder utilization worldwide, our success will depend on our ability to correctly forecast demand in these new markets. There is no assurance that we will be able to increase our business to meet targets globally, or that projections on which such targets are based will prove accurate, or that the pace of growth or coverage will meet customer expectations.

Our inability to meet customer supply requirements due to damage to or insufficient production capacity of the Red River Plant may have a material adverse effect on our business, results of operations and financial condition.

We own and operate a single activation-based manufacturing plant, which is our sole manufacturing plant for producing and selling AC products to our customers. Our ability to meet customer expectations, manage inventory, complete sales and achieve our objectives for operating efficiencies depends on the full-time operation of the Red River Plant. We cannot replicate our manufacturing methods at another plant due to the limited availability of similar manufacturing plants, the additional costs incurred in supplying raw materials such as lignite to another plant, and the risk of revealing our confidential and proprietary technologies and manufacturing processes.

If the Red River Plant was destroyed or damaged in a significant manner, we would suffer a loss of inventory to supply customers, likely incur additional costs to deliver products to our customers, and disrupt the ordinary course of our business. In addition, if contractual demand exceeds manufacturing capacity, we would jeopardize our ability to fulfill obligations under our contracts, which could, in turn, result in reduced sales, profitability, contract penalties or terminations and damage to our customer relationships and could have a material adverse effect on our business. While we have insured the Red River Plant against damage or destruction as well as for losses from business interruptions, there can be no assurance that any insurance coverage will be sufficient to cover any such losses.

Further, a prolonged disruption in our operations at the Red River Plant due to downtime or having to meet customer requirements that exceed its maximum manufacturing capacity would require us to seek alternative customer supply arrangements, which may not be on attractive terms to us or could lead to delays in distribution of products to our customers, either of which could have a material adverse effect on our business, results of operations and financial condition.

There can be no assurance that the Arq Acquisition will result in additional value for our stockholders or that the strategic evaluation process that we have undertaken will not have an adverse impact on our business.

As previously disclosed, in 2021, our board of directors initiated a strategic review to assess a range of strategic alternatives to maximize shareholder value. We have incurred substantial expenses related to the this strategic review process and the Arq Acquisition. There can be no assurance that the Arq Acquisition will provide greater value to our stockholders than that reflected in the current price of our common stock. As a result of the Arq Acquisition, perceived uncertainties related to our future may result in the loss of potential business opportunities and volatility in the market price of our common stock and may make it more difficult for us to attract and retain qualified personnel and business partners.

In connection with the Arq Acquisition, we may be required to take write-downs or write-offs, restructuring and impairment or other charges that could negatively affect our business, assets, liabilities, prospects, outlook, financial condition and results of operations.

Although we conducted extensive due diligence in connection with the Arq Acquisition, we cannot assure you that this diligence revealed all material issues that may be present, that it would be possible to uncover all material issues through a customary amount of due diligence, or that factors outside of ADES' and Arq's control will not later arise. Even if our due diligence successfully identified certain risks, unexpected risks may arise and previously known risks may materialize in a manner not consistent with our preliminary risk analysis. Further, as a result of the Arq Acquisition and the proposed operation of ADES going forward, we may be required to take write-offs or write-downs, restructuring and impairment or other charges that could negatively affect our business, assets, liabilities, prospects, outlook, financial condition and results of operations.

The failure to successfully integrate the businesses of ADES and Arq in the expected timeframe could adversely affect our future business and financial performance.

The combination of two independent companies is a complex, costly and time-consuming process. As a result, we will be required to devote significant management attention and resources to integrate the business practices and operations of ADES and Arq. The integration process may disrupt the business of either or both of the companies and, if implemented ineffectively, could preclude realization of the full benefits expected by us. The failure by us to meet the challenges involved in successfully integrating the operations of Arq or otherwise realizing the anticipated benefits of the Arq Acquisition could cause an interruption to our business activities and could seriously harm our results of operations. In addition, the integration of Arq may result in material unanticipated problems, expenses, liabilities, competitive responses, loss of customer relationships and diversion of management's attention, and may cause our stock price to decline. The difficulties of combining the operations of ADES and Arq include, among others:

- managing a larger company;
- coordinating geographically separate organizations;
- the potential diversion of management's focus and resources from other strategic opportunities and from operational matters;
- performance shortfalls at one or both of the companies as a result of the diversion of management's attention caused by completing the Arq Acquisition and integrating the combined companies' operations;
- aligning and executing a new business strategy;
- retaining existing customers and attracting new customers;
- maintaining employee morale and retaining key management and other employees;
- the disruption of, or the loss of momentum in, each company's ongoing business or inconsistencies in standards, controls, systems, procedures and policies;
- integrating two unique business cultures, which may prove to be incompatible;
- the possibility of faulty assumptions underlying expectations regarding the integration process;
- consolidating corporate and administrative infrastructures and eliminating duplicative operations;
- coordinating sales, distribution and marketing efforts;
- maintaining R&D technology momentum and lead customer technical collaboration progress;
- significant changes to current market conditions that may adversely affect the business plan;
- integrating IT, communications and other systems;
- changes in applicable laws and regulations;
- managing tax costs or inefficiencies associated with integrating the operations of ADES and Arq;
- unforeseen expenses or delays associated with the Arq Acquisition; and
- taking actions that may be required in connection with obtaining regulatory approvals.

Many of these factors will be outside of our control and any one of them could result in increased costs, decreased revenues and diversion of management's time and energy, which could materially impact our business, financial condition and results of operations. In addition, even if the operations of Arq are integrated successfully, we may not realize the full benefits of the Arq Acquisition, including the synergies, cost savings or growth opportunities that we expect. These benefits may not be achieved within the anticipated timeframe, or at all. As a result, we cannot assure you that the combination of ADES and Arq will result in the realization of the full benefits anticipated from the Arq Acquisition.

Specifically, the realization of the full benefits from the Arq Acquisition is dependent on our ability to construct new facilities and to integrate Arq's Powder on the projected timeline and within the projected budget. If these anticipated capital expenditures are delayed, whether as a result of unanticipated challenges in permitting, construction or economic conditions, the cost of such activities may increase and the timing of projected revenues may be impacted. Further, the costs of such construction activities may significantly exceed the costs included in the projections reviewed by ADES and Arq in connection with the Arq Acquisition. The costs of construction or other anticipated capital expenditures are subject to the effects of the current inflationary environment and we may not be able to successfully offset the effects of inflation.

Strategic relationships upon which Arq relies on are subject to change, which may diminish our ability to conduct our operations.

Our ability to successfully produce Arq's products and expand their utilization as intended depends on developing and maintaining close working relationships with industry participants. In addition, the dynamics of maintaining these relationships with strategic partners may require us to incur expenses or undertake activities we would not otherwise be inclined to do. If these strategic relationships are not established or maintained, our business prospects may be limited, which could negatively impact our business and results of operations.

The synergies attributable to the Arq Acquisition may vary from expectations.

We may fail to realize the anticipated benefits and synergies expected from the Arq Acquisition, which could adversely affect our business, financial condition and operating results. The success of the Arq Acquisition will depend, in significant part, on our ability to successfully integrate the businesses of ADES and Arq and realize the anticipated strategic benefits and synergies. We believe that the combination of the two businesses will allow us to enter into more diversified, higher margin markets with our products. However, achieving these goals requires, among other things, realization of the targeted cost synergies expected from the Arq Acquisition. These anticipated benefits and actual operating, technological, strategic and revenue opportunities may not be realized fully or at all, or may take longer to realize than expected. If we are not able to achieve these objectives and realize the anticipated benefits and synergies expected from the Arq Acquisition within the anticipated timeframe or at all, our business, financial condition and operating results may be adversely impacted.

Business issues currently faced by ADES or Arq may be imputed to the operations of the other.

To the extent either ADES or Arq currently has, or is perceived by customers to have, operational challenges, such as service performance, safety issues or workforce issues, those challenges may raise concerns by existing customers of ADES and Arq, respectively, which may limit or impede our future ability to obtain additional business from those customers.

If we fail to develop or maintain an effective system of internal controls as we integrate Arq's business operations and processes with ours, we may not be able to accurately report our financial results or prevent fraud. As a result, stockholders could lose confidence in our financial reporting, which would harm our business and the trading price of our common stock.

Effective internal controls are necessary for us to provide reliable financial reports, prevent fraud and operate successfully as a public company. If we cannot provide reliable financial reports or prevent fraud, our reputation and operating results would be harmed. We cannot be certain that our efforts to develop and maintain an effective system of internal controls will be successful, will be able to maintain adequate controls over our financial processes and reporting in the future, or will be able to comply with our obligations under Section 404 of the Sarbanes-Oxley Act of 2002. Any failure to develop or maintain effective internal controls, or difficulties encountered in implementing or improving internal controls, could harm our operating results or cause us to fail to meet our reporting obligations. Ineffective internal controls could additionally lead to increased costs to remediate any failures and could cause investors to lose confidence in our reported financial information, which would likely have a negative effect on the trading price of our common stock.

The financial effects of Tinuum Group providing indemnification under performance guarantees of its RC facilities are largely unknown and could adversely affect our financial condition.

Tinuum Group indemnifies certain utilities and lessees of RC facilities for particular risks associated with the operations and tax treatment of those facilities. We have provided limited, joint and several guarantees of Tinuum Group's obligations under those leases. To date, we have not been required to make any payments under such guarantees and are not aware of any actual or threatened requests or claims for payment under such guarantees. Nevertheless, if any such obligations are triggered in the future, any substantial payments made under such guarantees could have a material adverse effect on our financial condition, results of operations and cash flows.

A pandemic, epidemic or outbreak of an infectious disease such as COVID-19 may materially adversely affect our business.

The global or national outbreak of an infectious disease, such as COVID-19, may cause disruptions to our business and operational plans, which may include (i) shortages of employees, (ii) inefficiencies, delays and additional costs in our manufacturing, sales and customer service efforts, (iii) recommendations of, or restrictions imposed by, government and health authorities, including quarantines, to address an infectious disease, such as the COVID-19 pandemic, and (iv) restrictions that we impose, including facility shutdowns, to ensure the safety of employees and others. COVID-19 pandemic has had, and continues to have, a significant impact around the world, prompting governments and businesses to take unprecedented measures in response. While it is not possible to predict their extent or duration, these disruptions may have a material adverse effect on our business, financial condition and results of operations.

Demand for our products and services depends significantly on environmental laws and regulations related to emissions. Uncertainty as to the future of such laws and regulations, changes to such laws and regulations or granting of extensions of compliance deadlines has had, and will likely continue to have, a material effect on our business.

A significant market driver for our existing products and services and those planned in the future are existing and expected environmental laws and regulations, particularly those addressing the reduction of mercury and other emissions from coal-fired electricity generating units. If such laws and regulations are delayed, or are not enacted or are repealed or amended to be less strict, or include prolonged phase-in periods, or are not enforced, our business would be adversely affected by declining demand for such products and services. For example:

1. The implementation of environmental regulations regarding certain pollution control and permitting requirements has been delayed from time to time due to various lawsuits. The uncertainty created by litigation and reconsiderations of rule-making by the EPA has negatively impacted our business, results of operations and financial condition and will likely continue to do so.
2. To the extent federal, state and local legislation mandating that electric power generating companies serving a state or region purchase a minimum amount of power from renewable energy sources such as wind, hydroelectric, solar and geothermal, and such amount lessens demand for electricity from coal-fired plants, the demand for our products and services would likely decrease.

Federal, state and international laws or regulations addressing emissions from coal-fired electricity generating units, climate change or other actions to limit emissions, including public opposition to new coal-fired electricity generating units, has caused and could continue to cause electricity generators to transition from coal to other fuel and power sources, such as natural gas, nuclear, wind, hydroelectric and solar. The potential financial impact on us of future laws or regulations or public pressure will depend upon the degree to which electricity generators diminish their reliance on coal as a fuel source. That, in turn, will depend on a number of factors, including the specific requirements imposed by any such laws or regulations, the periods over which those laws or regulations are or will be phased in, the amount of public opposition and the state and cost of commercial development of related technologies and processes. In addition, Public Utility Commissions ("PUCs") may not allow utilities to charge consumers for, and pass on the cost of, emissions control technologies without federal or state mandates.

All of Arq's development operations will be subject to environmental permitting and regulations that can make operations expensive, or prohibit them altogether. Arq uses coal waste as its feedstock and the majority of waste sites targeted by Arq for development contain potential environmental liabilities. Arq therefore may be subject to potential risks and liabilities associated with pollution of the environment and the disposal of waste products that could occur as a result of its development and production activities.

We cannot reasonably predict the impact that any such future laws or regulations or public opposition may have on our results of operations, financial condition or cash flows.

With the Arq Acquisition, we will be subject to additional significant governmental regulations, which may negatively impact our operations and costs of conducting business.

Arq's operations are governed by extensive laws and regulations, including:

- laws and regulations related to exports, taxes and fees;
- labor standards and regulations related to the MSHA; and
- environmental standards and regulations related to waste disposal, toxic substances, land use and environmental protection, including environmental protection regulations related to water and air.

Existing and possible future laws, regulations and permits governing operations and activities of energy waste companies, or more stringent implementation, could have a material adverse impact on our business and cause increases in capital expenditures or require abandonment or delays in our products. Any future regulations regarding CO₂ emissions of coal reclamation and product manufacturing could also impact our future business.

Action by the EPA related to Mercury and Air Toxics Standards ("MATS") that decreases demand for our mercury removal products could have a material adverse effect on our business.

Our operating performance is largely dependent upon demand for mercury removal-related product, which is largely affected by the amount of coal-based power generation used in the U.S. and the continued regulation of utilities under MATS. In May 2020, the EPA reconsidered and withdrew its 2016 "supplemental finding" associated with the cost benefit analysis of the MATS Rule. In this action, the EPA found that it was not "appropriate and necessary" to regulate Hazardous Air Pollutants ("HAP") emissions from coal- and oil-fired Electric Utility Steam Generating Units ("EGUs"). However, the EPA expressly stated that the reconsideration neither removed coal- and oil-fired EGUs from the list of sources that must comply with the MATS rule, nor rescinded the MATS Rule, which has remained continuously in effect. On February 9, 2022, the EPA published a new proposed rule revoking the May 2020 withdrawal of the 2016 supplemental finding and affirming that it is "appropriate and necessary" to regulate HAP emissions from coal- and oil-fired EGUs. Any final action taken by the EPA related to MATS that decreases demand for our products for mercury removal will have a negative effect on our financial results. The timing and content of the final reconsideration rule are unknown.

Uncertain geopolitical conditions could adversely affect our business.

Uncertain geopolitical conditions, including the invasion of Ukraine, sanctions against Russia and other potential impacts on this region's economic environment and currencies may cause disruptions in our business. These include logistics delays or shortages in producing and shipping certain of our raw materials, increases in energy prices that could increase costs of certain of our raw materials, increases in transportation costs from overall higher gasoline prices and cyber-attacks targeted at U.S. power infrastructure that could impact demand for our products.

The failure of tariffs placed on U.S. imports of Chinese AC to adequately address the impact of low-priced imports from China could have a material adverse effect on the competitiveness and financial performance of our business.

Our business faces competition in the U.S. from low-priced imports of AC products. If the volumes of these low-priced imports increase, especially if they are sold at less than fair value, our sales of competing products could decline, which could have an adverse effect on our earnings. In addition, sales of these low-priced imports may negatively impact our pricing. To limit these activities, regulators in the U.S. have enacted an anti-dumping duty order on steam AC products from China. In 2018, the order was extended for an additional five years. The amount of anti-dumping duties collected on imports of steam AC from China is reviewed annually by the U.S. Department of Commerce. To the extent the anti-dumping margins do not adequately address the degree to which imports are unfairly traded, the anti-dumping order may be less effective in reducing the volume of these low-priced AC imports in the U.S., which could negatively affect demand and/or pricing for our products.

The market for consumables and other products that provide pollutant reduction is highly competitive, and some of our competitors are significantly larger and more established than we are, which could adversely impede our growth opportunities and financial results.

We operate in a highly competitive marketplace. Our ability to compete successfully depends in part upon our ability to maintain a production cost advantage, competitive technological capabilities and to continue to identify, develop and commercialize new and innovative products for existing and future customers. We may face increased competition from existing or newly developed products offered by industry competitors or other companies whose products offer a similar functionality as our products and could be substituted for our products, which may negatively affect demand for our products. In addition, market competition could negatively impact our ability to maintain or raise prices or maintain or grow our market position.

We compete against certain significantly larger and/or more established companies in the market for consumables and other products that provide mercury emissions reduction, water treatment and air purification.

Reduction of coal consumption by North American electricity power generators could result in less demand for our products and services. If utilities significantly reduce the number of coal-fired electricity generating units or the amount of coal burned without a corresponding increase in the services required at the remaining units, this could reduce our revenues and materially and adversely affect our business, financial condition and results of operations.

The amount of coal consumed for North American electricity power generation is affected by, among other things, (1) the location, availability, quality and price of alternative energy sources for power generation, such as natural gas, fuel oil, nuclear, hydroelectric, wind, biomass and solar power; and (2) technological developments, including those related to competing alternative energy sources.

Natural gas-fueled generation and renewable energy generation have displaced and may continue to displace coal-fueled generation, particularly from older, less efficient coal-powered generators. We expect that a significant amount of the new power generation necessary to meet increasing demand for electricity generation will be fueled by these sources. The price of natural gas has remained relatively competitive for power generation and the use of natural gas is perceived as having a lower environmental impact than burning coal. Natural gas-fired plants are cheaper to construct, and permits to construct these plants are easier to obtain, and ongoing costs of natural gas-fired plants associated with meeting environmental compliance are lower. Possible advances in technologies and incentives, such as tax credits that enhance the economics of renewable energy sources, could make those sources more competitive than coal. Any reduction in the amount of coal consumed by domestic electricity power generators, whether as a result of new power plants utilizing alternative energy sources or as a result of technological advances, could reduce the demand for our current products and services, thereby reducing our revenues and materially and adversely affecting our business and results of operations.

Additionally, long-term changes in environmental regulation that threaten or preclude the use of coal or other fossil fuels as a primary fuel source for electricity production may result in the reduction or closure of a significant number of coal-fired electric generating units, and may adversely affect our business, financial condition and results of operations.

The loss of, or significant reduction in, purchases by our largest customers could adversely affect our business, financial condition or results of operations.

For 2022, we derived approximately 51% of our total consumable revenues from our five largest customers. Our top three customers accounted for approximately 37% of our total consumable revenue for 2022. If any of our five largest customers were to significantly reduce the quantities of consumables they purchase from us, it may adversely affect our business, financial condition and results of operations.

Disruptions of supply chains may affect volatility in price and availability of raw materials.

The development of geopolitical conflicts in 2022 has contributed to disruptions of supply chains, resulting in cost increases for commodities, goods and services in many parts of the world. Significant disruptions of supply chains and higher costs persisted in 2022 and may continue into 2023 and beyond. The economic effects from these events over longer terms could negatively impact our business and results of operations.

The manufacturing and processing of our consumable products requires significant amounts of raw materials. The price and availability of those raw materials can be impacted by factors beyond our control. Our consumable products, exclusive of lignite coal, use a variety of additives. Significant movements or volatility in the costs of additives could have an adverse effect on our working capital or results of operations. Additionally, we purchase certain raw materials from selected key suppliers. While we have inventory of such raw materials, if any of these suppliers are unable to meet their obligations with us on a timely basis or at an acceptable price, we may be forced to incur higher costs to obtain the necessary raw materials or be unable to obtain the materials.

We may attempt to offset the increase in raw material costs or challenges in the supply of raw materials with price increases allowed in our contractual relationships, or through cost reduction efforts. If we are unable to fully offset the increased cost of raw materials through price increases, it could significantly impact our business, financial condition and results of operations.

We may experience a shortage of reliable and adequate transport capacity and any material increase in transportation costs could have a material adverse effect on our results of operations.

We currently plan to transport Arq's filter cake from the Corbin Facility to the Red River Plant by rail and truck. We may experience roadway or railway transportation disruptions that could have a material adverse effect on our operations or financial condition. There can be no assurance that we will be able to secure sufficient railway transport capacity to transport raw materials from the Corbin Facility to the Red River Plant. Further, in the event of railway transport shortages, there can be no assurance that road transportation will be able to satisfy the shortfall. Raw materials may also be combustible or ignitable and appropriate care and permitting may be required in handling and transporting such materials. In addition, any material increase in transportation costs could have a negative effect on the competitiveness of our future products, which may in turn have a material adverse effect on our business and results of operations.

We face operational risks inherent in mining operations and our mining operations have the potential to cause safety issues, including those that could result in significant personal injury.

We own the Five Forks Mine, a lignite coal mine located in Louisiana, which is operated for us by a third party. Mining operations by their nature involve a high level of uncertainty and are often affected by risks and hazards outside of our control. At the Five Forks Mine, the risks are primarily operational risks associated with the maintenance and operation of the heavy equipment required to dig and haul the lignite and risks relating to producing lower than expected lignite quality or recovery rates. Additionally, cost of inputs in our mining operation, most notably fuel cost, can create operational risks. The failure to adequately manage these risks could result in significant personal injury, loss of life, damage to mineral properties, production facilities or mining equipment, damage to the environment, delays in or reduced production and potential legal liabilities.

We also own the Marshall Mine, a former lignite coal mine located in Texas, which ceased mining operations in the third quarter of 2020 and is currently being reclaimed. Reclamation operations by their nature involve a high level of uncertainty and are often affected by risks and hazards outside of our control. In light of where we are in the reclamation process at the Marshall Mine, the current risks associated with the Marshall Mine are primarily those associated with our inability to fulfill our obligations in the reclamation process. The failure to adequately manage these risks could result in damage to the environment, delays in reclamation and potential legal liabilities.

Our operations and products are subject to extensive safety, health and environmental requirements that could increase our costs and/or impair our ability to manufacture and sell certain products.

Our ongoing operations are subject to extensive federal, state and local laws, regulations, rules and ordinances relating to safety, health and environmental matters, many of which provide for substantial monetary fines and potential criminal sanctions for violations. These include requirements to obtain and comply with various environmental-related permits for constructing any new facilities (or modifications to existing facilities) and operating all of our existing facilities. In addition, the Red River Plant may become subject to greenhouse gas emission trading requirements under which we may be required to purchase emission credits if our emission levels exceed our allocations. Greenhouse gas regulatory programs that have been adopted, such as cap-and-trade programs, have not had a significant impact on our business to date. However, costs of complying with regulations could increase, as concerns related to greenhouse gases and climate change continue to emerge.

The enactment of new environmental laws and regulations and/or the more aggressive interpretation of existing requirements could require us to incur significant costs for compliance or capital improvements or limit our current or planned operations, any of which could have a material adverse effect on our earnings or cash flow. We may attempt to offset the effects of these compliance costs through price increases, productivity improvements and cost reduction efforts. Our success in offsetting any such increased regulatory costs is largely influenced by competitive and economic conditions and could vary significantly depending on the market segment served. Such increases may not be accepted by our customers, may not be sufficient to compensate for increased regulatory costs or may decrease demand for our products and our volume of sales.

We may not be successful in achieving our growth expectations related to new products in our existing or new markets.

We may not be successful in achieving our growth expectations from developing new products for our existing or new markets. Further, there can be no assurance that costs incurred to develop new products will result in an increase in revenues. Additionally, our ability to bring new products to the market will depend on various factors, including, but not limited to, solving potential technical or manufacturing difficulties, competition and market acceptance, which may hinder the timeliness and cost to bring such products to production. These factors or delays could affect our future operating results.

Natural disasters could affect our operations and financial results.

We operate facilities, including the Red River Plant, Five Forks Mine and the Corbin Facility, that are exposed to natural hazards, such as floods, windstorms and hurricanes. Extreme weather events present physical risks that may become more frequent as a result of factors related to climate change. Such events could disrupt our supply of raw materials or otherwise affect production, transportation and delivery of our products or affect demand for our products.

In addition, extreme and unusually cold or hot temperatures throughout the U.S. could result in abnormally high loads on geographic electrical grids that could result in the failure of coal-fired power plants to produce electricity. If these plants were off-line for a significant period of time, the demand for our products could be less, which would impact our operations and financial results. Conversely, abnormally high loads on geographic electrical grids, resulting in increased demand of coal-fired power plants to produce electricity, could impact our ability to meet customer contracts and demands.

Information technology vulnerabilities and cyberattacks on our networks could have a material adverse impact on our business.

We rely on information technology ("IT") to manage and conduct business, both internally and externally, with our customers, suppliers and other third parties. Internet transactions involve the transmission and storage of data including customer and supplier business information. Therefore, maintaining the security of computers and other electronic devices, computer networks and data storage resources is a critical issue for us and our customers and suppliers because security breaches could result in reduced or lost ability to carry on our business and loss of, and/or unauthorized access to, confidential information.

We have limited personnel and other resources to address information technology reliability and security of our computer networks, and to respond to known security incidents to minimize potential adverse impact. Experienced hackers, cybercriminals and perpetrators of threats may be able to penetrate our network security and misappropriate or compromise our confidential information or that of third parties, create system disruptions or cause shutdowns. These perpetrators of cyberattacks also may be able to develop and deploy viruses, worms, malware and other malicious software programs that attack our information and networks or otherwise exploit any security vulnerabilities of our information and networks.

Techniques used to obtain unauthorized access to or sabotage systems change frequently and often are not recognized until after they are launched against a target, and we may be unable to anticipate these techniques or to implement adequate preventative measures. A breach of our IT systems and security measures as a result of third party action, malware, employee error, malfeasance or otherwise could materially adversely impact our business and results of operations and expose us to customer, supplier and other third party liabilities.

Risks Related to Intellectual Property

Failure to protect our intellectual property or infringement of our intellectual property by a third party could have an adverse impact on our financial condition.

We rely on a combination of patent, copyright and trademark laws, trade secrets, confidentiality procedures and contractual provisions to protect our proprietary rights. Such means of protecting our proprietary rights may not be adequate because they provide only limited protection or such protection may be prohibitively expensive to enforce. We also enter into confidentiality and non-disclosure agreements with our employees, consultants and many of our customers and vendors, and generally control

access to and distribution of our proprietary information. Notwithstanding these measures, a third party could copy or otherwise obtain and use our proprietary information without authorization. We cannot provide assurance that the steps we have taken will prevent misappropriation of our technology and intellectual property, which could negatively impact our business and financial condition. In addition, such actions taken by third parties could divert the attention of our management from the operation of our business.

We may be subject to intellectual property infringement claims from third parties that are costly to defend and that may limit our ability to use the disputed technologies.

If our technologies are alleged to infringe the intellectual property rights of others, we may be forced to mount a defense to such claims, which may be expensive and time consuming. During the pendency of litigation, we could be prevented from marketing and selling existing products or services and from pursuing research, development or commercialization of new or complimentary products or services. Further, we may be required to obtain licenses to third party intellectual property or be forced to develop or obtain alternative technologies. Our failure to obtain a license to a technology that we may require, or the need to develop or obtain alternative technologies, could significantly and negatively affect our business.

Indemnification of third-party licensees of our technologies against intellectual property infringement claims concerning our licensed technology and our products could be financially significant to us.

We have agreed to indemnify licensees of our technologies (including Tuum Group) and purchasers of our products, and we may enter into additional agreements with others under which we agree to indemnify and hold them harmless from losses they may incur as a result of the alleged infringement of third-party rights caused by the use of our technologies and products. Infringement claims, which may be expensive and time-consuming to defend, could have a material adverse effect on our business, operating results and financial condition, even if we are successful in defending ourselves (and the indemnified parties) against them.

Our future success depends in part on our ongoing identification and development of intellectual property and our ability to invest in and deploy new products, services and technologies into the marketplace efficiently and cost effectively.

The process of identifying customer needs and developing and enhancing products, services and solutions for our customer markets is complex, costly and uncertain. Any failure by us to identify and anticipate changing needs, emerging trends and new regulations could significantly harm our future market share and results of operations.

Risk related to tax matters

An "ownership change" is more likely as a result of the Arq Acquisition and PIPE Investment and could limit our ability to utilize tax credit carryforwards to offset future tax liability.

We have certain general business credits carryforwards ("Tax Credits"). As of December 31, 2022, we had \$86.1 million of Tax Credits, equaling 87% of our total gross deferred tax assets. Our ability to use these Tax Credits to offset future federal income tax liability may be significantly limited if we experience an "ownership change" as discussed below. Under the Internal Revenue Code ("IRC") and regulations promulgated by the U.S. Treasury Department and the IRS, we may carry forward or otherwise utilize the Tax Credits in certain circumstances to offset current and future federal income tax liabilities, subject to certain requirements and restrictions. To the extent that the Tax Credits do not otherwise become limited, we believe that we will have available a significant amount of Tax Credits in future years, and therefore the Tax Credits could be a substantial asset to us. However, if we experience an "ownership change," as defined in IRC Sections 382 and 383, our ability to use the Tax Credits may be substantially limited, and the timing of the usage of the Tax Credits could be substantially delayed, which could significantly impair the value of that asset.

In general, an "ownership change" under IRC Sections 382 and 383 occurs if the percentage of stock owned by an entity's 5% stockholders (as defined in IRC Section 382) increases by more than 50 percentage points over a rolling three-year period. An entity that experiences an ownership change generally will be subject to an annual limitation on its pre-ownership change tax credit carryforwards equal to the tax liability which is attributable to the amount of the entity's taxable income that does not exceed the equity value of the entity immediately before the ownership change, multiplied by the long-term, tax-exempt rate posted monthly by the IRS (subject to certain adjustments). The annual limitation would be increased each year to the extent that there is an unused limitation in a prior year. The limitation on our ability to utilize the Tax Credits arising from an ownership change under IRC Sections 382 and 383 would depend on the value of our equity at the time of any ownership change. If we were to experience an "ownership change," it is possible that a significant portion of our Tax Credits could expire before we would be able to use them to offset future federal income tax liability.

In connection with the Arq Acquisition and PIPE Investment, we issued additional shares of our stock. We performed an IRC Section 382 analysis related to the Arq Acquisition and PIPE Investment and determined we had not experienced an ownership change as of the date of the Arq Acquisition and PIPE Investment. However, the emergence of a single new 5% stockholder (as defined for purposes of IRC Section 382) or other changes, could result in our undergoing an "ownership change" and therefore there is a risk that we could experience an "ownership change" for purposes of IRC Sections 382 and 383.

On May 5, 2017, our board of directors (the "Board") approved the Tax Asset Protection Plan (the "TAPP") and declared a dividend of one preferred share purchase right (each, a "Right") for each outstanding share of our common stock. The TAPP was adopted in an effort to protect stockholder value by attempting to diminish the risk that our ability to use the Tax Credits to reduce potential future federal income tax obligations may become substantially limited (the "Protection Plan"). During the years 2018-2022, we executed amendments to the TAPP (the "TAPP Amendments"), which amended the definition of "Final Expiration Date" under the TAPP to extend the duration of the TAPP and makes associated changes in connection therewith. The most recent TAPP Amendment was approved at our 2022 annual meeting of stockholders and extended the Final Expiration Date to the close of business on December 31, 2023.

The TAPP, as amended, is intended to act as a deterrent to any person acquiring beneficial ownership of 4.99% or more of our outstanding common stock without the approval of the Board. Stockholders who beneficially owned 4.99% or more of our outstanding common stock upon execution of the Protection Plan will not trigger the Protection Plan so long as they do not acquire beneficial ownership of additional shares of our common stock. The Board may, in its sole discretion, also exempt any person from triggering the Protection Plan.

In connection with the Arq Acquisition and PIPE Investment, we granted a waiver under the TAPP for certain shareholders to acquire more shares of our stock in the future, provided that such acquisition is not expected to, and does not, effect an "ownership change" under IRC Sections 382 and 383. Despite the TAPP, our projections of what will effect an ownership change could be wrong, and with a waiver in place for certain shareholders, there is a risk that we experience an ownership change for purposes of IRC Sections 382 and 383 because of future acquisitions of our stock.

Risks Related to Our Common Stock

Our stock price is subject to volatility.

The market price of our common stock has experienced substantial price volatility in the past and may continue to do so. The market price of our common stock may continue to be affected by numerous factors, including:

- a. market perception of the Arq Acquisition;
- b. actual or anticipated fluctuations in our operating results and financial condition;
- c. changes in laws or regulations and court rulings and trends in our industry;
- d. announcements of sales awards;
- e. changes in supply and demand of components and materials;
- f. adoption of new tax regulations or accounting standards affecting our industry;
- g. changes in financial estimates by securities analysts;
- h. trends in social responsibility and investment guidelines;
- i. whether we are able and elect to pay cash dividends;
- j. the continuation of repurchasing shares of common stock under stock repurchase programs; and
- k. the degree of trading liquidity in our common stock and general market conditions.

From January 1, 2021 to December 31, 2022, the closing price of our common stock ranged from \$2.19 to \$8.15 per share. Stock price volatility over a given period may cause the average price at which we repurchase shares of our common stock to exceed the stock's price at a given point in time. We believe our stock price should reflect expectations of future growth and profitability. Future dividends are subject to declaration by the Board, and under our current stock repurchase program, we are not obligated to acquire any specific number of shares. If we fail to meet expectations related to future growth, profitability, dividends, stock repurchases or other market expectations, our stock price may decline significantly, which could have a material adverse impact on our ability to obtain additional capital and erode investor confidence, which could further reduce the liquidity of our common stock. We do not expect to repurchase additional shares of our common stock in the near term.

We are unlikely to resume our quarterly cash dividend program.

The Board first approved a \$0.25 per share of common stock quarterly dividend in June 2017. We last paid a cash dividend on March 10, 2020.

Under the Loan Agreement with CF Global, we are generally prohibited from paying dividends on our common stock as long as the Term Loan remains outstanding. Even if the Term Loan with CF Global is repaid, it is unlikely for the foreseeable future that we will resume declaring quarterly cash dividends under a dividend program. The payment of future dividends will be affected by, among other factors: (1) our views on potential future capital requirements for investments in acquisitions; (2) legal risks; (3) stock repurchase programs; (4) changes in federal and state income tax laws or corporate laws; (5) changes to our business model; and (6) restrictions on dividends set forth in the agreements governing our existing indebtedness (including the Loan Agreement with CF Global) and any additional indebtedness that we may incur in the future.

Our certificate of incorporation and bylaws contain provisions that may delay or prevent an otherwise beneficial takeover attempt of us.

Certain provisions of our certificate of incorporation and bylaws could make it more difficult for a third party to acquire us, even if doing so would be beneficial to our stockholders. These include provisions that:

- a. Limit the business at special meetings of stockholders to the purpose stated in a notice of the meeting;
- b. Authorize the issuance of "blank check" preferred stock, which is preferred stock with voting or other rights or preferences that could impede a takeover attempt and that the Board can create and issue without prior stockholder approval;
- c. Establish advance notice requirements for submitting nominations for election to the Board and for proposing matters that can be acted upon by stockholders at a meeting; and
- d. Require the affirmative vote of the "disinterested" holders of a majority of our common stock to approve certain business combinations involving an "interested stockholder" or its affiliates, unless either minimum price criteria or procedural requirements are met, or the transaction is approved by a majority of our "continuing directors" (known as "fair price provisions").

These provisions, alone or in combination with each other, may discourage transactions involving actual or potential changes of control, including transactions that otherwise could involve payment of a premium over prevailing market prices to holders of our common stock, or could limit the ability of our stockholders to approve transactions that they may deem to be in their best interest.

An increased focus on environmental, social and governance factors by institutional investors may negatively impact our access to capital and the liquidity of our stock price.

Some institutional investors have recently adopted Environmental, Social and Governance ("ESG") investing guidelines that may prevent them from increasing or taking new stakes with companies with exposure to fossil fuels. Additional institutional investors may adopt similar ESG investment guidelines. This could limit both the demand for owning our common stock and/or our access to capital. If such capital is desired, we cannot assure you that we will be able to obtain any additional equity or debt financing on terms that are acceptable to us. Given these emerging trends, liquidity in our common stock and our stock price may be negatively impacted.

We may require additional funding for our growth plans, and such funding may require us to issue additional shares of our common stock resulting in a dilution of your investment.

We estimate our funding requirements in order to implement our growth plans. If the actual funding required to implement growth initiatives should exceed funding estimates significantly, or our funds generated from our operations from such growth initiatives prove insufficient for such purposes, we may need to raise additional funds to meet these funding requirements.

These additional funds may be raised by issuing equity or debt securities or by borrowing from banks or other resources. We cannot assure you that we will be able to obtain any additional financing on terms that are acceptable to us, or at all. If we fail to obtain additional financing on terms that are acceptable to us, we may not be able to implement such plans fully. Such financing, even if obtained, may be accompanied by conditions that limit our ability to pay dividends or require us to seek lenders' consent for payment of dividends, or restrict our ability to operate our business by requiring lender's consent for certain corporate actions. Further, if we raise additional funds through the issuance of new shares of our common stock, any shareholders who are unable or unwilling to participate in such an additional round of fund raising may suffer dilution of their investment.

Certain legacy Arq shareholders and participants in the PIPE Investment hold a significant portion of the voting power of ADES common stock.

Certain legacy Arq shareholders and participants in the PIPE Investment hold a significant percentage of our outstanding common shares. Accordingly, such persons, acting individually or together, could have the ability to exert a substantial influence on actions requiring a stockholder vote. For example, Jeremy Blank, a former director of Arq Ltd. and who is currently one of our directors through his affiliates, hold approximately 2.36% of the outstanding shares of our common stock, and Julian McIntyre, who is Arq's former chief executive officer and director of Arq and who is currently one of our directors, holds approximately 4.49% of the outstanding shares of ADES common stock. The influence of these significant stockholders may be used in a manner that other stockholders may not support. Any such concentration of ownership may have the effect of delaying certain corporate actions, and may consequently impact the ability of other stockholders to influence the management and policies of ADES.

The conversion of the outstanding shares of our Series A Preferred Stock would dilute the ownership of holders of our Common Stock and may adversely affect the market price of our Common Stock.

Each share of our Series A Preferred Stock will be automatically converted into shares of Common Stock at the conversion ratio described herein upon the approval by the holders of the percentage of Common Stock required to approve such conversion under the applicable rules of Nasdaq. As of February 24, 2023, 5,294,462 shares of our Series A Preferred Stock were outstanding, representing approximately 16% of our outstanding common stock on an as-converted basis. In addition, prior to the conversion of the Series A Preferred Stock into Common Stock, each share of Series A Preferred Stock will accrue dividends on a quarterly basis at an annual rate of 8% on the \$4.00 Original Issuance Amount per share of Series A Preferred Stock. We will have the ability to pay any such dividends in kind by issuing additional shares of Series A Preferred Stock, which would increase the number of shares of Series A Preferred Stock outstanding and, consequently, the number of shares of our Common Stock that would be issuable upon the conversion of the Series A Preferred Stock.

The conversion of the Series A Preferred Stock to Common Stock would dilute the ownership interest of existing holders of our Common Stock, and any sales in the public market of the Common Stock issuable upon conversion of the Series A Preferred Stock would increase the number of shares of our Common Stock available for public trading, and could adversely affect prevailing market prices of our Common Stock.

Item 1B. Unresolved Staff Comments

None.

Item 2. Properties

Office and Facilities

We lease approximately 24,000 square feet of office space in Greenwood Village, Colorado for our corporate headquarters and primary research and development laboratory.

We own the Red River Plant, which is located on approximately 61 acres and leased approximately 22,000 square feet of warehouse space in Coushatta, Louisiana. We also lease approximately 60,000 square feet of warehouse space in Natchitoches Parish, Louisiana, where we operate a production and distribution facility. Further, we lease approximately 59,000 square feet of warehouse space and seven acres of land in Campti, Louisiana for storage of our products.

On February 1, 2023, following completion of the Arq Acquisition, we lease approximately 7,100 square feet of office space in Lexington, Kentucky and approximately 1,180 square feet in London, UK. Additionally, we also lease approximately 470 acres in Corbin, Kentucky where we operate the Corbin Facility.

Mining

As of December 31, 2022, we owned or controlled, primarily through long-term leases approximately 4,425 acres of coal land for surface mining. Of those acres, approximately 1,975 acres are located in Natchitoches Parish, Louisiana ("Five Forks"). The majority of the Five Forks land is leased for mineral rights and right-of-use purposes that expire at varying dates over the next 30 years and contain options to renew. The remaining land is owned by us.

Under our current mining plans, substantially all leased reserves will be mined out within the period of existing leases or within the time period of assured lease renewals. Royalties are paid to lessors either as a fixed price per ton or as a percentage of the gross sales price of the mined coal. The majority of the significant leases are on a percentage royalty basis. In some cases, a payment is required either at the time of execution of the lease or in annual installments. In most cases, the prepaid royalty amount is applied to reduce future production royalties.

The remaining 2,450 acres (of 4,425 acres of coal land for surface mining) pertain to the Marshall Mine, which is located in Harrison and Panola Counties, Texas. Mining operations on this land ceased in the third quarter of 2020.

Based on the materiality and the vertically-integrated company guidelines contained in Regulation S-K of the Securities Act and the Exchange Act, we have concluded that no additional disclosures related to our mining operations are required under this Item.

Item 3. Legal Proceedings

From time to time, we are involved in various litigation matters arising in the ordinary course of our business. Information with respect to this item may be found in Note 7 "Commitments and Contingencies" to the Consolidated Financial Statements included in Item 8 of this Report.

Item 4. Mine Safety Disclosures

The statement concerning mine safety violations or other regulatory matters required by Section 1503(a) of the Dodd-Frank Wall Street Reform and Consumer Protection Act and Item 104 of Regulation S-K is included in Exhibit 95 to this Report.

PART II

Item 5. Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

Market for Our Common Stock

As of December 31, 2022, our common stock was quoted on the Nasdaq Global Market under the symbol "ADES." The trading volume for our common stock is relatively limited. There is no assurance that an active trading market will provide adequate liquidity for our existing stockholders or for persons who may acquire our common stock in the future.

Dividends

In June 2017, we commenced a quarterly cash dividend program of \$0.25 per common share and made our most recent payment in March 2020. Under the Loan Agreement with CF Global, we are generally prohibited from paying dividends on our common stock as long as the Term Loan remains outstanding. Even if the Term Loan with CF Global is repaid, it is unlikely for the foreseeable future that we will resume declaring quarterly cash dividends under a dividend program.

Holders

The number of holders of record of our common stock as of February 24, 2023 was approximately 900. The approximate number of beneficial stockholders is estimated at 8,300.

Purchases of Equity Securities by the Company and Affiliated Purchasers

We had no repurchases of our common stock for the three months ended December 31, 2022.

We maintain a program to repurchase up to \$20.0 million of shares of our common stock under a stock repurchase program (the "Stock Repurchase Program") through open market transactions at prevailing market prices. The Board subsequently approved an amendment to The Stock Repurchase Program in which it authorized an incremental \$7.1 million, resulting in a total of \$10.0 million of shares of our common stock allowable to repurchase. As of December 31, 2022, \$7.0 million of shares of our common stock remained outstanding for repurchase under the Stock Repurchase Program, which will remain in effect until all amounts are utilized or it is otherwise modified by the Board. It is unlikely for the foreseeable future that we will resume repurchasing of our common stock under the repurchase program.

Item 6. Reserved

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

Overview

We sell consumable products that utilize AC and chemical-based technologies to a broad range of customers, including coal-fired utilities, industrials, water treatment plants, and other diverse markets through a customer supply agreement described below. Our primary products are comprised of AC, which is produced from a variety of carbonaceous raw materials. Our AC products include both PAC and GAC. Our proprietary technologies and associated product offerings provide purification solutions to enable our customers to reduce certain contaminants and pollutants to meet the challenges of existing and potential future regulations. Additionally, we own the Five Forks Mine, a lignite mine that supplies the primary raw material for the manufacturing of our products.

Through December 31, 2021, we operated two segments: Refined Coal ("RC") and Advanced Purification Technologies ("APT"). Our RC segment was comprised of our equity ownership in Tinum Group and Tinum Services, both of which are unconsolidated entities from which we generated substantial earnings through December 31, 2021. We also earned royalties for technologies that we licensed to Tinum Group, which were used at certain RC facilities to enhance combustion and reduce emissions of NOx and mercury from coal burned to generate electrical power. Effective December 31, 2021, the Section 45 tax credit period expired and, as a result, both Tinum Group and Tinum Services ceased their operations. During 2022, we received additional cash distributions from both Tinum Group and Tinum Services as they wound down their operations. We may receive additional cash distributions until both entities are dissolved.

Given the wind-down of Tinum Group and Tinum Services and the impact on our financial statements, we determined the historical RC segment no longer met the qualitative or quantitative criteria to be considered a reporting segment under U.S. GAAP. As a result, as well as the method in which the chief operating decision maker allocates resources, beginning January 1, 2022, we determined that we had one reportable segment, and therefore have removed segment disclosures for this Report.

Drivers of Demand and Key Factors Affecting Profitability

Drivers of demand and key factors affecting our profitability are sales of our consumables-based solutions for coal-fired power generation, industrials, municipal water customers and other diverse markets served by our major customer, Norit, to whom we sell product through the Supply Agreement discussed below. Our operating results are influenced by: (1) changes in our manufacturing production and sales volumes; (2) changes in price and product mix; (3) changes in coal-fired dispatch and electricity power generation sources and (4) changes in demand for contaminant removal within water treatment facilities. During 2022, we continued to see high demand for our AC products. As such, we continued to purchase inventory to supplement customer demands in excess of our production capacity and to achieve our target inventory levels. Although we expect to continue to supplement inventories throughout 2023, we anticipate that those purchases will be at reduced levels compared to 2022.

Supply Agreement

On September 30, 2020, we and Norit entered into the Supply Agreement, pursuant to which we agreed to sell and deliver to Norit, and Norit agreed to purchase and accept from us, our products. The term of the Supply Agreement is for 15 years with 10-year renewal terms that are automatic unless either party provides three years prior notice of intention not to renew before the end of any term.

For 2022 and 2021, the Supply Agreement provided material incremental volume and allowed us to capture operating cost efficiencies at the Red River Plant. The incremental volumes from the Supply Agreement have improved fixed cost absorption and resulted in increased gross margins. Further, the Supply Agreement has expanded our AC products to diverse end markets that are outside of those we historically served.

On February 25, 2022, we received \$10.6 million in cash from Norit as a result of the Change in Control, of which \$8.5 million represented full payment of an outstanding reimbursement amount related to reclamation of the Marshall Mine. As a result of the Change in Control, we recognized a loss of \$0.5 million in settlement of the outstanding reimbursement. The Change in Control did not impact any other provisions of the Supply Agreement.

Marshall Mine

Concurrently with the execution of the Supply Agreement, on September 30, 2020, we entered into the Mine Purchase Agreement from Cabot for 100% of the membership interests in Marshall Mine, LLC (the "Marshall Mine Acquisition") for a nominal purchase price. Marshall Mine, LLC owns a lignite mine located outside of Marshall, Texas (the "Marshall Mine"). We independently determined to immediately commenced activities to shutter the Marshall Mine and to incur the associated reclamation costs.

On September 2, 2022, we entered into a Purchase Agreement with a third party (the "MM Buyer") to sell all of our membership interests in Marshall Mine, LLC to the MM Buyer in exchange for a cash payment to be made by us to the MM Buyer of approximately \$2.4 million and the assumption by the MM Buyer of certain liabilities of Marshall Mine, LLC (the "MM Sale"). The MM Buyer previously operated the Marshall Mine on behalf of Marshall Mine, LLC and is currently performing reclamation under the Reclamation Contract. The Purchase Price is subject to adjustments for certain events that may occur during the period from the Agreement Date and the Closing Date.

The obligations of the Parties to close the MM Sale is subject to certain events, including (1) obtaining the approval of the Commission for an operating permit in the name of the MM Buyer or an affiliate of the MM Buyer; and (2) the MM Buyer replacing the Seller's surety bond with a reclamation performance bond, letter of credit or other form of security to which the MM Buyer or an affiliate of the MM Buyer is the principal that is satisfactory to the Commission. As of December 31, 2022, Marshall Mine, LLC had outstanding liabilities of approximately \$4.9 million, which we expect to be fully discharged upon payment of the MM Sale. We currently expect to close the MM Sale during the first half of 2023. However, since the Closing Date is uncertain, primarily due to the uncertain date for the Parties to receive approval of the MM Buyer's operating permit and surety bond by the Commission, we are unable to determine the accounting period in which we will recognize the MM Sale.

Significant Transactions Occurring in 2023

Arq Acquisition

As previously discussed in Part I - Item 1. "Business" ("Item 1") of this Report, on February 1, 2023, we executed the Purchase Agreement and completed the Arq Acquisition through the issuance to Arq Ltd. of shares of our common stock and Series A Preferred Stock in exchange for all of the direct and indirect equity interests of Arq Ltd.'s subsidiaries. We accounted for the Arq Acquisition as an acquisition of a business as of the Acquisition Date. The total Purchase Consideration was \$31.2 million based on the combined estimated fair values of the shares of Common Stock issued of \$12.4 million and the shares of Series A Preferred Stock issued of \$18.8 million.

Arq's principal office is located in London, United Kingdom, with additional offices located in Lexington and Corbin, Kentucky, near its main production facility. Arq is an environmental technology company that has developed a process for transforming coal waste into a purified, microfine carbon powder (Arq Powder) that can be used as an alternative to oil or in-ground mined coal to produce a range of carbon products. With the completion of the Arq Acquisition, we intend to first sell Arq Powder as a carbon filler for rubber composites and as a component for asphalt with an opportunity to evaluate expanding into other carbon products.

See further discussion of the Arq Acquisition and the material terms of the Series A Preferred Stock in Item 1.

PIPE Investment

As further described in Item 1 of this Report, on February 1, 2023, we closed the PIPE Investment for an aggregate purchase price of approximately \$15.4 million and at a purchase price per common share of \$4.00.

Loan Agreement

As further described in Item 1 of this Report, on February 1, 2023, ADES, as borrower, certain of its subsidiaries, as guarantors, and CF Global, as administrative agent and lender, entered into the Loan Agreement. The Term Loan has a term of 48 months and bears interest at a rate equal to either (a) Adjusted Term SOFR (subject to a 1.00% floor and a 2.00% cap) plus a margin of 9.00% paid in cash and 5.00% paid in kind or (b) Base Rate plus a margin of 8.00% paid in cash and 5.00% paid in kind, which interest on the Term Loan in each case shall be payable (or capitalized, in the case of in kind interest) quarterly in arrears. The Term Loan is secured by substantially all of the assets of ADES and its subsidiaries (including those acquired in the Transaction), subject to customary exceptions.

In addition, and in connection with the Loan Agreement and as consideration for the Term Loan, we agreed to issue CF Global the Warrant to purchase 325,457 shares of Common Stock. The Warrant has an exercise price of \$0.01 per share, subject to adjustment as set forth in the Warrant, is exercisable immediately and will expire on January 31, 2030. The terms of the Warrant do not allow for cash exercise, and the Warrant may only be exercised pursuant to the terms thereof.

See discussion of additional material terms of the Loan Agreement in "Liquidity and Capital Resources" of this Item 7 of this Report.

Termination of Transaction Agreement

As previously discussed in Item 1 of this Report, in connection with entry into the Purchase Agreement, the Transaction Agreement was terminated on February 1, 2023 pursuant to a termination agreement entered into by each of the parties to the Transaction Agreement. The Transaction Agreement would have provided, subject to its terms and conditions, for a business combination of Arq and ADES. By virtue of the termination of the Transaction Agreement, the Transaction Agreement became void and of no further force or effect, with no liability of the part of any party to the Transaction Agreement.

Components of Revenue, Expenses and Equity Method Investees

The following briefly describes the components of revenues and expenses as presented in the Consolidated Statements of Operations. Descriptions of the revenue recognition policies are included in Note 1 to the Consolidated Financial Statements included in Item 8 of this Report.

Revenues and cost of revenues

Consumables

We sell AC products and other chemical-based technology products to a broad range of customers, including coal-fired utilities, industrials, water treatment plants and other diverse markets. Currently, our products mostly serve coal-fired utilities and other industrial boilers that allow the respective utilities to comply with the regulatory air emissions standards and water treatment plants to remove contaminants from the water. Additionally, we sell AC to Norit and its customers through the Supply Agreement.

Consumables cost of revenues

Consumables cost of revenues includes all labor, fringe benefits, subcontract labor, additive and coal costs, materials, equipment, supplies, travel costs and any other costs and expenses directly related to the Company's production of revenues.

License royalties earned from Tinum Group

Through December 2021, we generated revenues from royalties ("M-45 Royalties") earned under a licensing arrangement ("M-45 License") of our M-45TM and M-45-PCTM emissions control technologies ("M-45 Technology") between us and Tinum Group, a related party. We recognized M-45 Royalties at a point in time based on the use of the M-45 Technology at certain RC facilities (the "M-45 Facilities") or through Tinum Group's use of licensed technology for rates in excess of amounts allowed for RC application. The amount of M-45 Royalties recognized was generally based on a percentage of pre-tax margins (as defined in the M-45 License) of the M-45 Facilities. With the expiration of the Section 45 tax credit program as of December 31, 2021, we no longer earn such royalties.

License royalties payable to Tinum Group

In December 2022, the Company and Tinum Group entered into an agreement (the "Tinum Group Royalty Agreement") whereby we pay Tinum Group a royalty (the "Tinum Group Royalty") for certain of our sales of its M-ProveTM products after the expiration of the Section 45 Tax Credit Program (beginning January 1, 2022) to certain of the M-45 Facilities. The Tinum Group Royalty is calculated based on "Net Profit" (as defined in the Tinum Royalty Agreement) on our sales of M-ProveTM product to certain of the M-45 Facilities. The Tinum Group Royalty Agreement is for an initial term of five years with automatic renewals of five years unless we and Tinum Group agree to terminate it.

Other Operating Expenses

Payroll and benefits

Payroll and benefits costs include personnel related fringe benefits, sales and administrative staff labor costs and stock compensation expenses. Payroll and benefits costs exclude direct labor included in Cost of revenues.

Legal and professional fees

Legal and professional costs include external legal, audit and consulting expenses.

General and administrative

General and administrative costs include director fees and expenses, bad debt expense, research and development expense and other general costs of conducting business. Research and development costs, net of reimbursements from cost-sharing arrangements, are charged to expense in the period incurred and are reported in the General and administrative line item in the Consolidated Statements of Operations.

Depreciation, amortization, depletion and accretion

Depreciation and amortization expense consists of depreciation expense related to property, plant and equipment and the amortization of long-lived intangible assets. Depletion and accretion expense consists of depletion expense related to the depletion of mine development costs and the accretion of mine reclamation liabilities.

Other Income (Expense), net

Earnings from equity method investments

Earnings from equity method investments represent our share of earnings (losses) related to our equity method investments. Through December 31, 2021, we had substantial earnings from Tinum Group and Tinum Services. With the expiration of the Section 45 tax credit program as of December 31, 2021, both Tinum Group and Tinum Services commenced winding down their operations related to the Section 45 tax credit program, although we have recognized earnings in 2022 related to cash distributions received.

Other income (expense)

The remaining components of other income (expense) include interest income, interest expense and other miscellaneous items.

Results of Operations

Presentation of Financial Results

For comparison purposes, the following tables set forth our results of operations for the years presented in the Consolidated Financial Statements included in Item 8 of this Report. The year-to-year comparison of financial results is not necessarily indicative of financial results that may be achieved in future years. Our Annual Report on Form 10-K for the year ended December 31, 2021 includes a discussion and analysis of our financial condition and results of operations for the year ended December 31, 2021 in Item 7 of Part II, "Management's Discussion and Analysis of Financial Condition and Results of Operations."

Year ended December 31, 2022 Compared to Year ended December 31, 2021

Total Revenues and Cost of Revenues

A summary of the components of revenues and cost of revenue for the years ended December 31, 2022 and 2021 is as follows:

<i>(Amounts in thousands except percentages)</i>	Years Ended December 31,		Change	
	2022	2021	(\$)	(%)
Revenues:				
Consumables	\$ 102,987	\$ 85,882	\$ 17,105	20 %
License royalties, related party	—	14,368	(14,368)	(100)%
Other	—	44	(44)	(100)%
Total revenues	\$ 102,987	\$ 100,294	\$ 2,693	3 %
Consumables cost of revenues, exclusive of depreciation and amortization	\$ 80,465	\$ 65,576	\$ 14,889	23 %

Consumables revenues and consumables cost of revenues

For the years ended December 31, 2022 and 2021, consumables revenue increased year over year primarily driven by higher volumes sold, which comprised \$11.8 million of the total change. Product volumes were higher among power generation customers primarily due to higher natural gas prices and higher demand for electricity compared to 2021, which contributed to increased utilization of coal-fired generation and increased demand for our products. Total consumables revenues also increased due to improved pricing for our products by approximately \$6.3 million from 2021. Offsetting these increases to Consumable revenue was the impact of unfavorable product mix of approximately \$1.4 million for the year ended December 31, 2022 compared to 2021.

Our Consumables gross margin, exclusive of depreciation and amortization, decreased for the year ended December 31, 2022 compared to 2021. For the year ended December 31, 2022, our consumables gross margin was negatively impacted by higher prices for key raw materials, transportation, including fuel, and other operational costs to produce and deliver our products, as well as an increase in the amount of third-party carbons purchased in order to meet customer demand for our products and supplement the higher operating utilization of the Red River Plant. Also negatively impacting Consumables gross margin for the year ended December 31, 2022 included \$0.8 million of Tinum Group Royalties. Offsetting these negative impacts were higher sales volumes, increases in the prices of our products implemented during the first half of 2022 and incremental positive impact from net electricity generated.

Consumables revenue continues to be affected by electricity demand, driven by seasonal weather and related power generation needs, as well as competitor prices related to alternative power generation sources such as natural gas and renewables.

For 2023, and based on current market estimates, we believe there will be a slight increase in Consumables revenue, driven by changes to customer and product mix, and overall improvements in pricing. However, we expect to see slight decreases in volumes compared to 2022 due to prices of alternative energy sources impacting the demand for our AC and chemical products related to power generation. There is risk to our outlook driven by inflationary pressures increasing our overall operating costs for our manufacturing operations as well as the impact of the 2023 Red River Plant turnaround.

License royalties, related party

As discussed above, Tinum Group ceased operation as of December 31, 2021, and as a result, we did not recognize any revenues from license royalties from Tinum Group for the year ended December 31, 2022.

Other Operating Expenses

A summary of the components of our operating expenses, exclusive of cost of revenues items (presented above), for the years ended December 31, 2022 and 2021 is as follows:

<i>(in thousands, except percentages)</i>	Years Ended December 31,		Change	
	2022	2021	(\$)	(%)
Operating expenses:				
Payroll and benefits	\$ 10,540	\$ 11,315	\$ (775)	(7)%
Legal and professional fees	9,455	6,260	3,195	51 %
General and administrative	8,145	7,060	1,085	15 %
Depreciation, amortization, depletion and accretion	6,416	7,933	(1,517)	(19)%
Loss (gain) on change in estimate, asset retirement obligation	34	(2,702)	2,736	(101)%
	<u>\$ 34,590</u>	<u>\$ 29,866</u>	<u>\$ 4,724</u>	<u>16 %</u>

Payroll and benefits

Payroll and benefits expenses decreased year over year primarily due to a decrease in payroll-related expenses of \$1.0 million as our headcount decreased year over year. Partially offsetting these decreases was an increase in expense of \$0.2 million related to the Amended Retention Agreements, which were agreements between the Company and its executive officers and certain other key employees in order to maintain the Company's business operations while it pursued and executed on its strategic initiatives.

Legal and professional fees

Legal and professional fees increased year over year as a result of an increase in costs incurred related to the Arq Acquisition. The increase was comprised mostly of legal and consulting fees of \$0.9 million and \$1.9 million, respectively. In addition, there was an increase in accounting related fees of approximately \$0.4 million year over year.

General and administrative

General and administrative expenses increased year over year primarily due to increases in director compensation, travel and recruiting expenses, of approximately \$0.7 million. Additionally, rent and occupancy related expenses increased year over year by \$0.3 million.

Depreciation, amortization, depletion and accretion

Depreciation and amortization expense decreased year over year primarily due to higher production volumes during the year ended December 31, 2022, resulting in \$0.9 million less absorption of depreciation in inventory. Further driving the decrease was a reduction in accretion expense of \$0.5 million related to the reduction of the Marshall Mine ARO compared to prior year and a decrease in amortization expense of \$0.4 million related to patents. Offsetting these decreases was an increase in depreciation expense of \$0.2 million related to fixed asset additions during the year ended December 31, 2022.

Loss (gain) on change in estimate, asset retirement obligation

For the year ended December 31, 2022, we recorded a loss on change in estimate of \$34 thousand primarily based on a change in the timing of estimated payments for future reclamation requirements of the Marshall Mine.

For the year ended December 31, 2021, we recorded a gain on change in estimate of \$2.7 million related to a reduction in scope of our estimated future reclamation efforts of the Marshall Mine.

Other Income (Expense), net

A summary of the components of our other income (expense), net for the years ended December 31, 2022 and 2021 is as follows:

<i>(Amounts in thousands, except percentages)</i>	<u>Years Ended December 31,</u>		<u>Change</u>	
	<u>2022</u>	<u>2021</u>	<u>(\$)</u>	<u>(%)</u>
Other income (expense):				
Earnings from equity method investments	\$ 3,541	\$ 68,726	\$ (65,185)	(95)%
Gain on extinguishment of debt	—	3,345	(3,345)	(100)%
Interest expense	(336)	(1,490)	1,154	(77)%
Other	155	640	(485)	(76)%
Total other income	<u>\$ 3,360</u>	<u>\$ 71,221</u>	<u>\$ (67,861)</u>	<u>(95)%</u>

Earnings from equity method investments

The following table presents the equity method earnings by investee for the years ended December 31, 2022 and 2021:

<i>(in thousands)</i>	<u>Years Ended December 31,</u>		<u>Change</u>	
	<u>2022</u>	<u>2021</u>	<u>(\$)</u>	<u>(%)</u>
Earnings from Tinuum Group	\$ 3,455	\$ 61,837	\$ (58,382)	(94)%
Earnings from Tinuum Services	85	6,952	(6,867)	(99)%
Earnings (loss) from other	1	(63)	64	(102)%
Earnings from equity method investments	<u>\$ 3,541</u>	<u>\$ 68,726</u>	<u>\$ (65,185)</u>	<u>(95)%</u>

For the year ended December 31, 2022, we recognized \$3.5 million in equity earnings from Tinium Group compared to our proportionate share of Tinium Group's net loss of \$1.3 million for the year. For the year ended December 31, 2021, we recognized \$61.8 million in equity earnings from Tinium Group compared to our proportionate share of Tinium Group's net income of \$40.1 million. The difference between our pro-rata share of Tinium Group's net (loss) income and our equity earnings from Tinium Group as reported on the Consolidated Statements of Operations is the result of cumulative distributions received from Tinium Group being in excess of the carrying value of the investment, and therefore we recognize such excess distributions as equity method earnings in the period the distributions occur.

For the year ended December 31, 2022, we recognized \$0.1 million in equity earnings from Tinium Services compared to our proportionate share of Tinium Services' net loss of \$0.1 million for this period. The difference between our pro-rata share of Tinium Services' net loss and our earnings from the Tinium Services equity method investment as reported on the Consolidated Statements of Operations is the result of cumulative distributions received from Tinium Services being in excess of the carrying value of the investment, and therefore we recognize such excess distributions as equity method earnings in the period the distributions occur. For the year ended December 31, 2021, we recognized \$7.7 million in equity earnings from Tinium Services, which was our proportionate share of Tinium Services' net income of \$15.4 million for the year.

As of December 31, 2021, we concluded the carrying amount of our investment in Tinium Services was not fully recoverable due to the remaining expected future cash distributions expected to be received as Tinium Services shuttered its operations in 2022 as a result of the expiration of the Section 45 tax credit period as of December 31, 2021. As a result, we wrote-down our investment in the amount of \$0.7 million, which is included in the "Earnings from equity method investments" line item in the Consolidated Statement of Operations for the year ended December 31, 2021.

Gain on extinguishment of debt

For the year ended December 31, 2021, we recorded a gain on extinguishment of debt in the amount of \$3.3 million from a loan that we had entered into during 2020 under the Paycheck Protection Program. The loan was formally forgiven in July 2021.

Interest expense

Interest expense decreased year over year by \$1.2 million primarily due to the pay-off of a senior term loan as of June 1, 2021.

Income tax expense

For the year ended December 31, 2022, our reported income tax expense was \$0.2 million and was based on an effective rate of (2)%. The difference between our reported income tax expense and the expected federal benefit, as a result of pretax loss recognized for the year ended December 31, 2022, was primarily due to permanent differences related to acquisition-related costs, an increase in the valuation allowance on our deferred tax assets and state income taxes, net of federal benefit.

For the year ended December 31, 2021, our reported income tax expense of \$15.7 million and was based on an effective rate of 21%. While the Federal Rate was also 21%, our effective tax rate was primarily increased by state income tax expense, net of federal benefit and primarily decreased from a reduction in the valuation allowance on our deferred tax assets.

Accounting for income taxes requires that companies assess whether a valuation allowance should be recorded against their deferred tax asset based on an assessment of the amount of the deferred tax asset that is "more likely than not" to be realized. Valuation allowances are established, when necessary, to reduce deferred tax assets to the amount that is more likely than not to be realized.

We assess a valuation allowance recorded against deferred tax assets at each reporting date. The determination of whether a valuation allowance for deferred tax assets is appropriate requires the evaluation of positive and negative evidence that can be objectively verified. Consideration must be given to all sources of taxable income available to realize the deferred tax asset, including, as applicable, the future reversal of existing temporary differences, future taxable income forecasts exclusive of the reversal of temporary differences and carryforwards, taxable income in carryback years and tax planning strategies. In estimating taxes, we assess the relative merits and risks of the appropriate tax treatment of transactions taking into account statutory, judicial, and regulatory guidance.

As of December 31, 2022, we concluded it is more likely than not we will not generate sufficient taxable income within the allowable carryforward periods to realize any of our net deferred tax assets, and fully reserved for such assets as of December 31, 2022. In reaching this conclusion, we primarily considered forecasts of future taxable losses. As of December 31, 2022 and 2021, we had a valuation allowance of \$88.3 million and \$87.5 million, respectively, on our deferred tax assets.

The ability to recognize the remaining deferred tax assets that continue to be subject to a valuation allowance is evaluated on a quarterly basis to determine if there are any significant events that would affect the ability to utilize those deferred tax assets. Our estimate of future taxable income or losses is based on internal projections that consider historical performance, assumptions on future performance and external data. If events are identified that affect our ability to utilize our deferred tax assets, or if additional deferred tax assets are generated, we update our analysis to determine if an increase to a valuation allowance is required. Such an increase could have a material adverse effect on our financial condition and results of operations. Conversely, better than expected results and continued positive results and trends could result in a decrease to a valuation allowance, and any such decreases could have a material positive effect on our financial condition and results of operations.

See additional discussion in Note 13 of the Consolidated Financial Statements included in Item 8 of this Report.

Tax Credits and Obligations

Through December 31, 2021, we earned substantial tax credits under the Section 45 tax credit program, which program expired on December 31, 2021. As of December 31, 2022, we had approximately \$86.1 million in Section 45 tax credit carryforwards.

In the hypothetical event of an ownership change, as defined by IRC Section 382, utilization of general business credits ("Tax Credits") generated prior to the change would be subject to an annual limitation imposed by IRC Section 383 for Tax Credits. The results of a recent analysis indicated that we had not experienced an ownership change as of December 31, 2022, as defined by IRC Section 382.

We performed an IRC Section 382 analysis related to the Arq Acquisition and PIPE Investment and determined we had not experienced an ownership change as of the Acquisition Date.

Such analysis for the period from the Acquisition Date through the date of this Report has not been completed. Therefore, it is possible that we experienced an ownership change between the Acquisition Date and the date of the filing of this Report, thus subjecting our Tax Credit carryforwards to limitation.

Non-GAAP Financial Measures

To supplement our financial information presented in accordance with accounting principles generally accepted in the United States ("GAAP"), we provide non-GAAP measures of certain financial performance. These non-GAAP measures include EBITDA (EBITDA Loss) and Adjusted EBITDA (EBITDA Loss). We have included these non-GAAP measures because management believes that they help to facilitate period to period comparisons of our operating results and provide useful information to both management and users of the financial statements by excluding certain expenses, gains and losses which may not be indicative of core operating results and business outlook. Management uses these non-GAAP measures in evaluating the performance of our business.

These non-GAAP measures are not in accordance with, or an alternative to, measures prepared in accordance with GAAP and may be different from non-GAAP measures used by other companies. In addition, these non-GAAP measures are not based on any comprehensive set of accounting rules or principles. These measures should only be used to evaluate our results of operations in conjunction with the corresponding GAAP measures.

We define EBITDA (EBITDA Loss) as net income (loss) adjusted for the impact of the following items that are either non-cash or that we do not consider representative of our ongoing operating performance: depreciation, amortization, depletion, accretion, amortization of upfront customer consideration that was recorded as a component of the Marshall Mine Acquisition ("Upfront Customer Consideration"), interest expense, net and income tax expense. We define Adjusted EBITDA (EBITDA Loss) as EBITDA (EBITDA Loss), reduced by the non-cash impact of equity earnings from equity method investments, gain on change in estimate of asset retirement obligations and gain on extinguishment of debt, and increased by cash distributions from equity method investments, loss on early settlement of the Norit Receivable and the change in AROs as a result of a change in estimate. Because Adjusted EBITDA (EBITDA Loss) omits certain non-cash items, we believe that the measure is less susceptible to variances that affect our operating performance.

When used in conjunction with GAAP financial measures, we believe these non-GAAP measures are supplemental measures of operating performance which explain our operating performance for our period to period comparisons and against our competitors' performance. Generally, we believe these non-GAAP measures are less susceptible to variances that affect our operating performance results.

We expect the adjustments to EBITDA (EBITDA Loss) and Adjusted EBITDA (EBITDA Loss) in future periods will be generally similar. These non-GAAP measures have limitations as analytical tools and should not be considered in isolation or as a substitute for analyzing our results as reported under GAAP.

Reconciliation of Net (loss) income to (EBITDA Loss) EBITDA and Adjusted EBITDA

The following table reconciles net (loss) income, our most directly comparable as-reported financial measure calculated in accordance with GAAP, to (EBITDA Loss) EBITDA and Adjusted EBITDA.

	Year ended December 31,	
	2022	2021
Net (loss) income (1)	\$ (8,917)	\$ 60,401
Depreciation, amortization, depletion and accretion	6,416	7,933
Amortization of Upfront Customer Consideration	508	508
Interest expense, net	97	1,164
Income tax expense	209	15,672
(EBITDA Loss) EBITDA	<u>(1,687)</u>	<u>85,678</u>
Cash distributions from equity method investees	5,933	74,026
Equity earnings	(3,541)	(68,726)
Gain on extinguishment of debt	—	(3,345)
Loss (gain) on change in estimate, asset retirement obligation	34	(2,702)
Loss on early settlement of Norit Receivable	535	—
Adjusted EBITDA	<u>\$ 1,274</u>	<u>\$ 84,931</u>

(1) Included in Net loss for the year ended December 31, 2022, was \$5.0 million of transactions costs incurred related to the Arq Acquisition.

Liquidity and Capital Resources

Current Resources and Factors Affecting Our Liquidity

As of December 31, 2022, our principal future sources of liquidity included:

- cash on hand, excluding restricted cash of \$10.0 million pledged as collateral under a surety bond agreement; and
- our operations

For the year ended December 31, 2022, our principal uses of liquidity included:

- our business operating expenses;
- capital and spare parts expenditures;
- payments on our lease obligations; and
- payments for reclamation associated with the Five Forks Mine and Marshall Mine.

On February 1, 2023, we closed the PIPE Investment for an aggregate purchase price of \$15.4 million. Further, on February 1, 2023 we entered into the Loan Agreement for \$10.0 million, of which we received \$8.5 million net proceeds.

Due to the expiration of the Section 45 tax credit period as of December 31, 2021, and the resultant wind down of Tinum Group's and Tinum Services' operations in 2022, distributions from Tinum Group and Tinum Services are no longer a significant source of liquidity.

Tinum Group and Tinum Services Distributions

The following table summarizes the cash distributions from our equity method investments for the years ended December 31, 2022 and 2021:

<i>(in thousands)</i>	Year ended December 31,	
	2022	2021
Tinum Group	\$ 3,455	\$ 65,224
Tinum Services	2,476	8,802
Other	2	—
Distributions from equity method investees	<u>\$ 5,933</u>	<u>\$ 74,026</u>

Cash distributions from Tinum Group and Tinum Services for 2022 decreased by \$68.1 million compared to 2021 primarily due to Tinum Group and Tinum Services ceasing material operations as of December 31, 2021.

Cash Flows

Cash and restricted cash decreased from \$88.8 million as of December 31, 2021, to \$76.4 million as of December 31, 2022, a decrease of \$12.3 million. The following table summarizes our cash flows for the years ended December 31, 2022 and 2021, respectively:

<i>(in thousands)</i>	Years Ended December 31,		
	2022	2021	Change
Cash provided by (used in):			
Operating activities	\$ (6,061)	\$ 25,999	\$ (32,060)
Investing activities	(4,608)	44,378	(48,986)
Financing activities	(1,679)	(17,529)	15,850
Net change in Cash and Restricted Cash	<u>\$ (12,348)</u>	<u>\$ 52,848</u>	<u>\$ (65,196)</u>

Cash flows from operating activities

Cash flows used in operating activities for the year ended December 31, 2022 was \$6.1 million compared to cash flows provided by operating activities of \$26.0 million for the year ended December 31, 2021. The net decrease was primarily due to the following: (1) a net change in net income (loss) of \$69.3 million year over year as a result of net loss recognized for the year ended December 31, 2022; (2) a decrease in Distributions from equity method investees, return on investment of \$20.6 million year over year; and (3) a decrease in the change in net working capital of \$7.1 million year over year. Offsetting the net decrease in cash flows used in operating activities year over year were a decrease in Earnings from equity method investments of \$65.2 million and Gain on extinguishment of debt of \$3.3 million recorded in 2021.

Cash flows from investing activities

Cash flows used in investing activities for the year ended December 31, 2022 was \$4.6 million compared to cash flows provided by investing activities of \$44.4 million for the year ended December 31, 2021. The decrease was primarily due to a decrease in distributions from equity earnings in excess of cumulative earnings of \$47.4 million and an increase in acquisitions of property and equipment year over year.

Cash flows from financing activities

Cash flows used in financing activities for the year ended December 31, 2022 decreased by \$15.9 million compared to the year ended December 31, 2021 primarily due to the pay-off of a senior term loan of \$16.0 million in 2021.

Material Cash Requirements

Our ability to continue to generate sufficient cash flow required to meet ongoing operational needs and obligations depends upon several factors. These include executing on our contracts and initiatives and increasing our share of the market for APT consumables, including expanding our overall AC business into additional adjacent markets and improving our customer and product mix.

We expect that our cash on hand as of December 31, 2022, as well as the cash proceeds related to the PIPE Investment and Term Loan, will provide sufficient liquidity to fund operations for the next 12 months.

Capital expenditures

For 2023, we expect to spend between \$40.0 million and \$45.0 million in capital expenditures compared to \$9.5 million incurred in 2022. Of the capital expenditures forecasted in 2023, approximately 65% is expected to go towards growth projects as part of the Arq Acquisition and the remaining 35% is forecasted for improvements to the Red River Plant and Five Forks Mine, including our planned plant turnaround. Capital expenditures planned for 2023 are dependent on many factors, including the approval of certain environmental permits. Approval of such permits can impact the timing and amount of capital expenditures.

Retention Agreements

In August 2022, we paid \$1.0 million pursuant to the payment terms of the Amended Retention Agreements. As of December 31, 2022, the remaining outstanding amount due under the Amended Retention Agreements was \$1.4 million, which was paid on January 27, 2023.

Five Forks Mine and Marshall Mine Reclamation Obligations

As of December 31, 2022, we had outstanding surety bonds with regulatory commissions totaling \$24.1 million related to both the Five Forks Mine and Marshall Mine. As of December 31, 2022, and as required by our surety bond provider, we held restricted cash of \$10.0 million pledged as collateral related to performance requirements required under reclamation contracts for both the Five Forks Mine and Marshall Mine. We expect that the obligations secured by these surety bonds will be performed in the ordinary course of business and in accordance with the applicable contractual terms. To the extent that the obligations are performed, the related surety bonds should be released and collateral requirements reduced. However, in the event any surety bond is called, our indemnity obligations could require us to reimburse the surety bond provider.

We intend to fund our mine reclamation costs associated with both the Five Forks Mine and Marshall Mine from cash on hand. On September 2, 2022, we executed the sale of all of our equity interests in Marshall Mine, LLC. We expect to close this transaction in the first half of 2023 at which time, we expect to fully discharge all liabilities associated with reclamation and also reduce both the surety bond and collateral requirements, as we will only be obligated for future reclamation costs for the Five Forks Mine.

Arq Reclamation Obligations

As of the Acquisition Date, we assumed surety bonds of Arq held with regulatory commissions totaling approximately of \$3.0 million, of which approximately \$2.9 million are related to the Corbin facility.

Contractual obligations as of December 31, 2022 are as follows:

<i>(in thousands)</i>	Payment Due by Period				
	Total	Less than 1 year	1-3 years	4-5 years	After 5 years
Finance lease obligations	\$ 5,038	\$ 1,371	\$ 1,804	\$ 457	\$ 1,406
Operating lease obligations (1)	14,060	3,206	4,195	2,942	3,717
Reclamation obligation, Marshall Mine	4,679	4,679	—	—	—
	<u>\$ 23,777</u>	<u>\$ 9,256</u>	<u>\$ 5,999</u>	<u>\$ 3,399</u>	<u>\$ 5,123</u>

(1) Includes total rental payments of \$3.3 million under corporate headquarters and primary laboratory lease executed in November 2022 with lease commencement date of May 1, 2023.

The table above excludes our asset retirement obligation ("ARO") related to reclamation of the Five Forks Mine (the "Five Forks ARO"), as the timing and amount of payments to satisfy the Five Forks ARO are uncertain and are based on numerous factors including, but not limited to, the Five Forks Mine expected closure date. As of December 31, 2022, our Consolidated Balance Sheet reflects a liability of \$3.9 million for the Five Forks ARO.

Loan Agreement

Under the terms of the Term Loan, executed on February 1, 2023, we are permitted to prepay the Term Loan at any time subject to the following prepayment premium: (i) prior to the twelve (12) month anniversary of the Closing Date, the Make-Whole Amount (as defined below), (ii) thereafter but prior to the thirty-six (36) month anniversary of the Closing Date, 2.00% of the outstanding principal amount of the Term Loan being repaid or prepaid or (iii) thereafter until the maturity date, 1.00% of the outstanding principal amount of the Term Loan being repaid or prepaid. The "Make-Whole Amount", with respect to any repayment or prepayment, is (i) an amount equal to all required interest payable (except for currently accrued and unpaid interest) on the aggregate principal amount of the Term Loan subject to such prepayment or repayment from the date of such prepayment or repayment through but excluding the date that is the first anniversary of the Closing Date calculated using an interest rate equal to (x) Adjusted Term SOFR for an interest period of one month in effect on the third U.S. Government Securities Business Day prior to such prepayment or repayment plus (y) 14.00% per annum and assuming all interest was paid in cash, plus (ii) a prepayment premium of 2.00% on the aggregate principal amount of the Term Loan subject to such prepayment or repayment.

The Loan Agreement includes, among others, the following covenants: (1) beginning March 31, 2023 and as of the end of each fiscal quarter thereafter, we must maintain a minimum cash balance of \$5.0 million; (2) (x) as of December 31, 2023, for the fiscal year then ended, we must have a minimum annual revenue, on a consolidated basis, of \$70.0 million, (y) as of December 31, 2024, for the fiscal year then ended, we must have a minimum annual revenue, on a consolidated basis, of \$85.0 million and (z) for any fiscal year thereafter, we must have a minimum annual revenue, on a consolidated basis, of \$100.0 million; (3) (x) as of December 31, 2024, for the fiscal year then ended, we must have a minimum EBITDA of \$3.0 million and (y) for any fiscal year thereafter, we must have a minimum EBITDA of \$16.0 million; and (4) beginning after the fiscal quarter ending September 30, 2023, during an LTV Trigger Period, we must not exceed a loan to value (based on the consolidated total assets of ADES and its subsidiaries) ratio of 0.40:1.00.

Critical Accounting Policies and Estimates

Our significant accounting policies are discussed in Note 1 to the Consolidated Financial Statements included in Item 8 of this Report. In presenting our financial statements in conformity with GAAP, we are required to make estimates and assumptions that affect the amounts reported therein. Several of the estimates and assumptions we are required to make relate to matters that are inherently uncertain as they pertain to future events. Our estimates are based on historical experience and other assumptions believed to be reasonable under the circumstances, and we evaluate these estimates on an ongoing basis. Actual results may differ from these estimates under different assumptions or conditions.

We believe that the accounting estimates discussed below are critical to understanding our historical and future performance, as these estimates relate to the more significant areas involving management's judgments and estimates.

Business Combinations, including asset acquisitions

We apply the acquisition method to acquisitions of both businesses and assets and allocate the purchase price to the tangible and intangible assets acquired and liabilities assumed based on their estimated fair values at the acquisition date. The purchase price allocation process requires us to make significant estimates and assumptions with respect to assets acquired and liabilities assumed. We believe the assumptions and estimates we make are reasonable, they are based in part on historical experience, market conditions and information obtained from management of the acquired company or group of assets and are inherently uncertain.

Examples of critical estimates in valuing certain of long-lived assets, including intangible assets, we have acquired or may acquire in the future include but are not limited to:

- future expected cash flows from revenues;
- historical and expected customer attrition rates and anticipated growth in revenues from acquired customers;
- the acquired company's developed technology as well as assumptions about the period of time the acquired developed technology will continue to be used in the combined company's product portfolio;
- the expected use and useful lives of the acquired assets; and
- valuation methods and discount rates used in estimating the values of the assets acquired and liabilities assumed.

In regard to the Marshall Mine Acquisition, which we accounted for as an asset acquisition, we recorded the fair value of assumed assets, which included property, plant and equipment and spare parts and assumed liabilities. In addition, we recorded other assets, including Upfront Customer Consideration and the Cabot Receivable, and a liability for the Marshall Mine ARO.

Carrying value of long-lived assets and intangibles

We review and evaluate our long-lived assets and intangibles for impairment at least annually, or more frequently when events or changes in circumstances indicate that the related carrying amounts may not be recoverable. An impairment loss is measured and recorded for long-lived assets and intangibles based on the excess of their carrying amounts over their estimated fair values. Fair value is typically determined through the use of an income approach utilizing estimates of discounted pretax future cash flows or a market approach utilizing recent transaction activity for comparable assets.

Asset Retirement Obligations

Accounting for AROs requires us to make estimates of future costs unique to a specific mining operation that we will incur to complete the reclamation and remediation work required to comply with existing laws and regulations. Any such changes in future costs, the timing of reclamation activities, scope or the exclusion of certain costs not considered reclamation and remediation costs could materially impact the amounts charged to earnings for reclamation and remediation. Additionally, future changes to environmental laws and regulations could increase the scope of reclamation and remediation work required.

Five Forks Mine ARO - Reclamation costs related to the Five Forks Mine ARO are allocated to expense over the life of the related mine assets and are periodically adjusted to reflect changes in the estimated present value resulting from the passage of time and revisions to the estimates of either the timing or amount of the reclamation costs. Remediation costs for the Five Forks Mine are accrued based on management's best estimate of the costs expected to be incurred. Such cost estimates may include ongoing care, maintenance and monitoring costs. Reclamation obligations are based on the timing of estimated spending for an existing environmental disturbance. We review, on at least an annual basis, the future expected costs and the timing of such costs for the Five Forks Mine ARO.

Marshall Mine ARO - Reclamation costs related to the Marshall Mine are based on a capped fee structure for a significant portion of the ARO liability based on the initial estimate of the total costs of reclamation, which provides for certain contingencies that could increase or decrease the reclamation fee based on the reclamation agreement executed between us and the Marshall Mine operator. The timing of payments may vary, and in valuing the Marshall Mine ARO, we account for these timing differences, as well as changes in actual reclamation costs, on a quarterly basis.

Income Taxes

We account for income taxes under the asset and liability method, which requires judgment in determining income tax expense and the related balance sheet amounts. This includes estimating and analyzing historical and projected future operating results, the reversal of taxable temporary differences, tax planning strategies, and the ultimate outcome of uncertain income tax positions. Actual income taxes paid may vary from estimates depending on changes in income tax laws, actual results of operations, state apportionment and, if applicable, final audits of tax returns by taxing authorities. Tax assessments may arise several years after tax returns have been filed. Changes in the estimates and assumptions used for calculating income tax expense and potential differences in actual results from estimates could have a material impact on our results of operations and financial condition.

We recognize deferred tax assets to the extent that we believe these assets are more likely than not to be realized. In making such a determination, we consider all available positive and negative evidence, including future reversals of existing taxable temporary differences, projected future taxable income, tax-planning strategies and results of recent operations.

We establish a valuation allowance against our deferred tax assets when, based upon the weight of all available evidence, we believe it is more likely than not that some portion or all of the deferred tax assets will not be realized. In making this determination, we consider the relative impact of all of the available positive and negative evidence regarding future sources of taxable income and tax planning strategies. However, there could be a material impact to our effective tax rate if there is a significant change in our estimates of future taxable income. If and when our estimates change, or there is a change in the value of deferred tax assets or liabilities warranting the need to reassess the realizability of deferred tax assets, we adjust a valuation allowance through the provision for income taxes in the period in which this determination is made. Refer to Note 13 of our Consolidated Financial Statements included in Item 8 of this Report for additional information regarding our deferred tax assets and liabilities and related deferred income tax expense (benefit).

Recently Issued Accounting Standards

Refer to Note 1 of the Consolidated Financial Statements included in Item 8 of this Report for information regarding recently issued accounting standards.

Item 7A. Quantitative and Qualitative Disclosures About Market Risk

The information under this Item is not required to be provided by smaller reporting companies.

Item 8. Financial Statements and Supplementary Data

Advanced Emissions Solutions, Inc.

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Advanced Emissions Solutions, Inc.

Consolidated Financial Statements:

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Report of Independent Registered Public Accounting Firm

To the Shareholders and the Board of Directors of
Advanced Emissions Solutions, Inc.

Opinion on the Financial Statements

We have audited the accompanying consolidated balance sheets of Advanced Emissions Solutions, Inc. and subsidiaries (the "Company") as of December 31, 2022 and 2021, the related consolidated statements of operations, changes in stockholders' equity and cash flows for the years then ended, and the related notes (collectively referred to as the "consolidated financial statements"). In our opinion, the consolidated financial statements present fairly, in all material respects, the consolidated financial position of the Company as of December 31, 2022 and 2021, and the consolidated results of its operations and its cash flows for the years then ended, in conformity with accounting principles generally accepted in the United States of America.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the Company's internal control over financial reporting as of December 31, 2022, based on criteria established in *Internal Control - Integrated Framework* (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission and our report dated March 8, 2023 expressed an unqualified opinion on the Company's internal control over financial reporting.

Basis for Opinion

These consolidated financial statements are the responsibility of the Company's management. Our responsibility is to express an opinion on the Company's consolidated financial statements based on our audits. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures to respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. We believe that our audits provide a reasonable basis for our opinion.

Critical Audit Matters

Critical audit matters are matters arising from the current period audit of the consolidated financial statements that were communicated or required to be communicated to the audit committee and that (1) relate to accounts or disclosures that are material to the financial statements and (2) involved our especially challenging, subjective, or complex judgments. We determined that there are no critical audit matters.

/s/ Moss Adams LLP

Denver, Colorado
March 8, 2023

We have served as the Company's auditor since 2017.

Advanced Emissions Solutions, Inc. and Subsidiaries
Consolidated Balance Sheets

<i>(in thousands, except share data)</i>	As of December 31,	
	2022	2021
ASSETS		
Current assets:		
Cash	\$ 66,432	\$ 78,753
Receivables, net	13,864	12,622
Receivables, related party	—	2,481
Inventories, net	17,828	7,850
Prepaid expenses and other current assets	7,538	6,661
Total current assets	<u>105,662</u>	<u>108,367</u>
Restricted cash, long-term	10,000	10,027
Property, plant and equipment, net of accumulated depreciation of \$11,897 and \$7,684, respectively	34,855	30,171
Other long-term assets, net	30,647	36,871
Total Assets	<u>\$ 181,164</u>	<u>\$ 185,436</u>
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable and accrued expenses	\$ 16,108	\$ 16,486
Current portion of long-term debt	1,131	1,011
Other current liabilities	6,645	5,124
Total current liabilities	<u>23,884</u>	<u>22,621</u>
Long-term debt, net of current portion	3,450	3,152
Other long-term liabilities	13,851	12,362
Total Liabilities	<u>41,185</u>	<u>38,135</u>
Commitments and contingencies (Note 7)		
Stockholders' equity:		
Preferred stock: par value of \$.001 per share, 50,000,000 shares authorized, none outstanding	—	—
Common stock: par value of \$.001 per share, 100,000,000 shares authorized, 23,788,319 and 23,460,212 shares issued and 19,170,173 and 18,842,066 shares outstanding at December 31, 2022 and 2021, respectively	24	23
Treasury stock, at cost: 4,618,146 and 4,618,146 shares as of December 31, 2022 and 2021, respectively	(47,692)	(47,692)
Additional paid-in capital	103,698	102,106
Retained earnings	83,949	92,864
Total stockholders' equity	<u>139,979</u>	<u>147,301</u>
Total Liabilities and Stockholders' equity	<u>\$ 181,164</u>	<u>\$ 185,436</u>

See Notes to the Consolidated Financial Statements.

Advanced Emissions Solutions, Inc. and Subsidiaries
Consolidated Statements of Operations

<i>(in thousands, except per share data)</i>	Years Ended December 31,	
	2022	2021
Revenues:		
Consumables	\$ 102,987	\$ 85,882
License royalties, related party	—	14,368
Other	—	44
Total revenues	102,987	100,294
Operating expenses:		
Consumables cost of revenues, exclusive of depreciation and amortization	80,465	65,576
Payroll and benefits	10,540	11,315
Legal and professional fees	9,455	6,260
General and administrative	8,145	7,060
Depreciation, amortization, depletion and accretion	6,416	7,933
Loss (gain) on change in estimate, asset retirement obligation	34	(2,702)
Total operating expenses	115,055	95,442
Operating (loss) income	(12,068)	4,852
Other income (expense):		
Earnings from equity method investments	3,541	68,726
Gain on extinguishment of debt	—	3,345
Interest expense	(336)	(1,490)
Other	155	640
Total other income	3,360	71,221
(Loss) income before income tax expense	(8,708)	76,073
Income tax expense	209	15,672
Net (loss) income	\$ (8,917)	\$ 60,401
(Loss) earnings per common share (Note 1):		
Basic	\$ (0.48)	\$ 3.31
Diluted	\$ (0.48)	\$ 3.27
Weighted-average number of common shares outstanding:		
Basic	18,453	18,258
Diluted	18,453	18,461

See Notes to the Consolidated Financial Statements.

Advanced Emissions Solutions, Inc. and Subsidiaries
Consolidated Statements of Changes in Stockholders' Equity

<i>(in thousands, except share data)</i>	Common Stock		Treasury Stock		Additional Paid-in Capital	Retained Earnings/ (Accumulated Deficit)	Total Stockholders' Equity
	Shares	Amount	Shares	Amount			
Balances, January 1, 2021	23,141,284	\$ 23	(4,618,146)	\$ (47,692)	\$ 100,425	\$ 32,454	\$ 85,210
Stock-based compensation	364,657	—	—	—	1,927	—	1,927
Repurchase of common shares to satisfy tax withholdings	(45,729)	—	—	—	(246)	—	(246)
Accrued dividends cancelled on common stock	—	—	—	—	—	9	9
Net income	—	—	—	—	—	60,401	60,401
Balances, December 31, 2021	23,460,212	\$ 23	(4,618,146)	\$ (47,692)	\$ 102,106	\$ 92,864	\$ 147,301
Stock-based compensation	389,312	1	—	—	1,980	—	1,981
Repurchase of common shares to satisfy tax withholdings	(61,205)	—	—	—	(388)	—	(388)
Accrued dividends cancelled on common stock	—	—	—	—	—	2	2
Net loss	—	—	—	—	—	(8,917)	(8,917)
Balances, December 31, 2022	23,788,319	\$ 24	(4,618,146)	\$ (47,692)	\$ 103,698	\$ 83,949	\$ 139,979

See Notes to the Consolidated Financial Statements.

Advanced Emissions Solutions, Inc. and Subsidiaries
Consolidated Statements of Cash Flows

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
Cash flows from operating activities		
Net (loss) income	\$ (8,917)	\$ 60,401
Adjustments to reconcile net (loss) income to net cash (used in) provided by operating activities:		
Depreciation, amortization, depletion and accretion	6,416	7,933
Earnings from equity method investments	(3,541)	(68,726)
Operating lease expense	2,709	2,038
Stock-based compensation expense	1,981	1,927
Loss (gain) on change in estimate, asset retirement obligation	34	(2,702)
Deferred income tax expense	—	10,604
Amortization of debt discount and debt issuance costs	—	945
Gain on extinguishment of debt	—	(3,345)
Other non-cash items, net	496	(209)
Changes in operating assets and liabilities:		
Receivables, net	(1,312)	540
Related party receivables	2,481	972
Prepaid expenses and other current assets	(876)	(2,064)
Inventories, net	(9,686)	1,394
Other long-term assets, net	245	(4,270)
Accounts payable and accrued expenses	(911)	5,197
Other current liabilities	1,008	(8,279)
Operating lease liabilities	1,521	3,344
Other long-term liabilities	(6)	(2,645)
Distributions from equity method investees, return on investment	2,297	22,944
Net cash (used in) provided by operating activities	\$ (6,061)	\$ 25,999

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
Cash flows from investing activities		
Distributions from equity method investees in excess of cumulative earnings	\$ 3,636	\$ 51,082
Acquisition of property, equipment and intangible assets, net	(8,914)	(6,201)
Mine development costs	(583)	(1,398)
Proceeds from sale of property and equipment	1,253	895
Net cash (used in) provided by investing activities	<u>(4,608)</u>	<u>44,378</u>
Cash flows from financing activities		
Principal payments on term loan	—	(16,000)
Principal payments on finance lease obligations	(1,246)	(1,190)
Repurchase of shares to satisfy tax withholdings	(388)	(246)
Dividends paid	(45)	(93)
Net cash used in financing activities	<u>(1,679)</u>	<u>(17,529)</u>
(Decrease) increase in Cash and Restricted Cash	<u>(12,348)</u>	<u>52,848</u>
Cash and Restricted Cash, beginning of year	88,780	35,932
Cash and Restricted Cash, end of year	<u>\$ 76,432</u>	<u>\$ 88,780</u>
Supplemental disclosure of cash flow information:		
Cash paid for interest	\$ 334	\$ 524
Cash paid for income taxes	\$ 3	\$ 8,882
Supplemental disclosure of non-cash investing and financing activities:		
Acquisition of property and equipment under finance lease	\$ 1,641	\$ —
Change in accrued purchases for property and equipment	\$ 532	\$ 183
Change in asset retirement obligation	\$ —	\$ 121

See Notes to the Consolidated Financial Statements.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Note 1 - Summary of Operations and Significant Accounting Policies

Nature of Operations

Advanced Emissions Solutions, Inc. ("ADES" or the "Company") is a Delaware corporation with its principal office located in Greenwood Village, Colorado and manufacturing, mining and logistic operations located in Louisiana. The Company is principally engaged in the sale of consumable air and water treatment options including activated carbon ("AC") and chemical technologies. The Company's proprietary technologies in the advanced purification technologies ("APT") market enable customers to reduce air and water contaminants, including mercury and other pollutants, to maximize utilization levels and to improve operating efficiencies to meet the challenges of existing and pending air quality and water regulations. The Company manufactures and sells AC and other chemicals used to capture and remove contaminants for coal-fired power, industrial and water treatment markets. The Company also owns an associated lignite mine (the "Five Forks Mine") which supplies the primary raw material for manufacturing AC.

Through December 31, 2021, the Company generated substantial earnings from its equity ownership in Tinium Group, LLC ("Tinium Group") and Tinium Services, LLC ("Tinium Services"), both of which are unconsolidated entities. Both Tinium Group and Tinium Services ceased material operations effective December 31, 2021 as a result of the expiration of a tax credit program under Internal Revenue Code Section 45 - Production Tax Credit (the "Section 45 Tax Credit Program"). Tinium Group provided reduction of mercury and nitrogen oxide ("NOx") emissions at select coal-fired power generators through the production and sale of refined coal ("RC") that qualified for tax credits under the Section 45 Tax Credit Program ("Section 45 tax credits"). The Company also earned royalties for technologies which were licensed to Tinium Group and used at certain RC facilities to enhance combustion and reduce emissions of NOx and mercury from coal burned to generate electrical power. Tinium Services operated and maintained the RC facilities under operating and maintenance agreements with Tinium Group and owners or lessees of the RC facilities. Presently, both Tinium Group and Tinium Services continue to wind-down their operations.

Principles of Consolidation

The Consolidated Financial Statements include accounts of wholly-owned subsidiaries and variable interest entities ("VIEs") in which the Company is the primary beneficiary. All significant intercompany balances and transactions have been eliminated in consolidation.

All investments in partially owned entities for which the Company has greater than 20% ownership are accounted for using the equity method based on the legal form of the Company's ownership percentage and are included in the Other long-term assets, net line item in the Consolidated Balance Sheets. As of December 31, 2022, the Company holds equity interests of 42.5% and 50.0% in Tinium Group and Tinium Services, respectively.

Cash and restricted cash

Cash consists of cash on hand and bank deposits. Restricted cash is comprised of posted cash collateral required under a surety bond contract related to the Five Forks Mine and the Company's mine located at Marshall, Texas.

Concentration of credit risk

As of December 31, 2022, the Company's financial instruments that are exposed to concentrations of credit risk consist primarily of cash and cash equivalents. The Company holds cash and cash equivalents at two financial institutions as of December 31, 2022. If those institutions were unable to perform their obligations, the Company would be at risk regarding the amount of its cash balance in excess of the federal deposit insurance corporation limits (\$250 thousand).

Fair value measurements

The carrying amounts of our cash, restricted cash, accounts receivable, accounts payable and other current liabilities approximate fair value as recorded due to the short-term nature of these instruments.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Receivables, net

Receivables, net are recorded at net realizable value, which includes an appropriate allowance for estimated uncollectible amounts to reflect any loss anticipated on the receivables. Increases and decreases in the allowance for doubtful accounts are established based upon changes in the credit quality of receivables and are included as a component of the General and administrative line item in the Consolidated Statements of Operations. The allowance for doubtful accounts is based on historical experience, general economic conditions and the credit quality of specific accounts and was not material as of December 31, 2022 and 2021.

Inventories, net

Inventories, net are stated at the lower of average cost or net realizable value and consist principally of raw materials and finished goods related to the Company's AC and chemical products. The cost of inventory is determined using the average cost method.

Inventories are periodically reviewed for both potential obsolescence and potential declines in anticipated selling prices. In this review, the Company makes assumptions about the future demand for and market value of the inventory and estimates the amount of any obsolete, unmarketable, slow moving or overvalued inventory. If applicable, the Company will write down the value of inventories by an amount equal to the difference between the cost of the inventory and its estimated net realizable value.

Additional details regarding Inventory balances are included in Note 5.

Intangible Assets

Intangible assets consist of patents, licensed technology, customer relationships, developed technologies and trade names.

The Company has developed technologies resulting in patents being granted by the U.S. Patent and Trademark Office or other regulatory offices. Legal costs associated with securing the patent are capitalized and amortized over the legal or useful life beginning on the patent filing date.

The following table details the components of the Company's intangible assets:

<i>(in thousands, except years)</i>	Weighted Average Remaining Amortization Period (in years)	As of December 31,			
		2022		2021	
		Cost	Net of Accumulated Amortization	Cost	Net of Accumulated Amortization
Customer relationships	0.9	\$ 835	\$ 226	\$ 835	\$ 470
Patents	11.3	1,490	456	1,454	426
Developed technology	0.9	607	165	607	341
Total		\$ 2,932	\$ 847	\$ 2,896	\$ 1,237

Included in the Consolidated Statements of Operations is amortization expense related to intangible assets of \$0.5 million and \$0.9 million for the years ended December 31, 2022 and 2021, respectively. The estimated future amortization expense for existing intangible assets as of December 31, 2022 is expected to be \$0.4 million for the year ended December 31, 2023 and less than \$0.1 million for each of the four succeeding fiscal years.

Investments

The investments in entities in which the Company does not have a controlling interest (financial or operating), but where it has the ability to exercise significant influence over operating and financial policies, are accounted for using the equity method of accounting. Whether or not the Company exercises significant influence with respect to an investee depends on an evaluation of several factors including, among others, representation on the investee company's board of directors and the Company's ownership level. Under the equity method of accounting, an investee company's financial statements are not consolidated in the Company's Consolidated Balance Sheets and Consolidated Statements of Operations; however, the Company's share of the earnings or losses of the investee is reported in the "Earnings from equity method investments" line item in the Consolidated

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Statements of Operations, and the Company's carrying value in an equity method investee is reported in the "Other long-term assets, net" line in the Consolidated Balance Sheets.

The Company recognizes equity earnings (loss) from equity method investments based on its percentage ownership in the investee. The Company recognizes distributions received in excess of the carrying value of an equity method investment as equity method earnings in the period the distributions occur to the extent that the Company has not guaranteed any obligations of the investee or is not contractually required to provide additional funding to the investee. Subsequent earnings from investees where the Company has recognized earnings from distributions in excess of the carrying value of the equity method investment are recognized for the excess of cumulative earnings over previously recognized earnings from distributions. Additionally, when the Company's carrying value in an equity method investment is zero, and the Company has not guaranteed any obligations of the investee or is not required to provide additional funding to the investee, the Company will not recognize its share of any reported losses by the investee until future earnings are generated to offset previously unrecognized losses. Therefore, equity income (loss) reported in the Company's Consolidated Statements of Operations for certain equity method investees may differ from a mathematical calculation of net income or loss attributable to its equity interest based on the percentage ownership of the Company's equity interest and the net income or loss attributable to equity owners as shown in the investee's statements of operations.

Distributions from equity method investees are reported in the Consolidated Statements of Cash Flows as "return on investment" in Operating cash flows until such time as the carrying value in an equity method investee is reduced to zero. Thereafter, such distributions are reported as "distributions in excess of cumulative earnings" in Investing cash flows. See Note 10 for additional information regarding the Company's equity method investments.

Investments in partially-owned subsidiaries for which the Company has less-than-20% ownership are accounted for in accordance with accounting guidance applicable to equity investments that do not qualify for the equity method of accounting. The Company evaluates these types of investments for changes in fair value and, if there is change, recognizes the change in the Consolidated Statement of Operations. If no such events or changes in circumstances have occurred related to these types of investments, the fair value is estimated only if practicable to do so.

Property, Plant and Equipment

Property, plant and equipment are stated at cost less accumulated depreciation and includes leasehold improvements. Depreciation on assets is computed using the straight-line method over the lesser of the estimated useful lives of the related assets or the lease term (ranging from 2 to 31 years). Maintenance and repairs that do not extend the useful life of the respective asset are charged to Operating expenses as incurred. When assets are retired, or otherwise disposed of, the property accounts are relieved of costs and accumulated depreciation and any resulting gain or loss is credited or charged to income. The Company performs an evaluation of the recoverability of the carrying value of property, plant and equipment to determine if facts and circumstances indicate that their carrying values may be impaired. Amortization of finance leased assets is included in depreciation expense and is calculated using the straight-line method over the term of the lease.

Leases

The Company records a right of use ("ROU") asset and related liability under a contract or part of a contract when it conveys the right to control the use of an identified asset for a period of time in exchange for consideration. Control over the use of an identified asset occurs when an entity has both the right to obtain substantially all of the economic benefits from the use of an identified asset and the right to direct the use of that identified asset. The determination of whether a contract contains a lease may require significant assumptions and judgments.

For all classes of underlying assets, the Company does not separate nonlease components from lease components and accounts for each separate lease component and the nonlease components associated with that lease component as a single lease component. The Company records lease liabilities and related ROU assets for all leases that have a term of greater than one year. For short-term leases (leases with terms of less than one year), the Company expenses lease payments on a straight-line basis over the lease term.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Variable lease payments represent payments made by a lessee for the right to use an underlying asset that vary because of changes in facts or circumstances occurring after the commencement date of a lease other than the passage of time. Variable lease payments that are based on an index or rate, calculated by using the index or rate that exists on the lease commencement date, are included in the measurement of a lease liability. Certain of the Company's operating leases for office facilities contain variable lease components that are not based on an index or rate, and the Company recognizes these payments as variable lease expense in the period in which the obligation for those payments is incurred.

The Company calculates lease liabilities based on the present value of lease payments discounted by the rate implicit in the lease or, if not readily determinable, the Company's incremental borrowing rate.

Finance lease liabilities are subsequently measured by increasing the carrying amount to reflect interest expense on the finance lease liability and reducing the carrying amount of the lease liability to reflect lease payments made during the period. Interest on finance lease liabilities is determined in each period during the lease term as the amount that produces a constant periodic discount rate on the remaining balance of the lease liability. ROU assets under finance leases are amortized over the remaining lease term on a straight-line basis. Interest expense related to finance lease liabilities and amortization of ROU assets under finance leases are included in the "Interest expense" and "Depreciation, amortization, depletion and accretion" line items, respectively, in the Consolidated Statements of Operations.

Operating lease liabilities are subsequently measured at the present value of the lease payments not yet paid, discounted using the discount rate for the lease established at the inception date of the lease. ROU assets under operating leases are subsequently measured at the amounts of the related operating lease liability, adjusted for, as applicable, prepaid or accrued lease payments, the remaining balance of any lease incentives received, unamortized initial direct costs and impairment. Lease expense from operating leases is recognized as a single lease cost over the remaining lease term on a straight-line basis. Variable lease payments not included in operating lease liabilities are recognized as expense in the period in which the obligation for those payments is incurred. Lease expense from operating leases is included in the "General and administrative" and "Consumables Cost of revenues, excluding depreciation and amortization" line items in the Consolidated Statements of Operations.

Other Assets

Mine Development Costs

Mine development costs are related to the Five Forks Mine and are stated at cost less accumulated depletion and include acquisition costs, the cost of other development work and mitigation costs. Costs are amortized over the estimated life of the related mine reserves, which as of December 31, 2022 is estimated to be 12 years. The Company performs an evaluation of the recoverability of the carrying value of mine development costs to determine if facts and circumstances indicate that their carrying value may be impaired and if any adjustment is warranted. Mine development costs are reported in the "Other long-term assets, net" line item in the Consolidated Balance Sheets.

Spare Parts

Spare parts include critical spares required to support plant operations. Parts and supply costs are determined using the lower of cost or estimated replacement cost. Parts are recorded as maintenance expenses or capitalized in the period in which they are consumed or put into use. Spare parts are reported in the "Other long-term assets, net" line item in the Consolidated Balance Sheets.

Revenue Recognition

The Company recognizes revenue from a contract with a customer when a performance obligation under the terms of a contract with a customer is satisfied, which is when the customer controls the promised goods or services that are transferred in satisfaction of the performance obligation. Revenue is measured as the amount of consideration that is expected to be received in exchange for transferring goods or providing services, and the transaction price is generally fixed and generally does not contain variable or noncash consideration. In addition, the Company's contracts with customers generally do not contain customer refund or return provisions or other similar obligations. Transfer of control and satisfaction of performance obligations are further discussed in each of the revenue components listed below.

The Company uses estimates and judgments in determining the nature and timing of satisfaction of performance obligations, the standalone selling price ("SSP") of performance obligations and the allocation of the transaction price to multiple performance obligations, if any.

The Company's revenue component is Consumables sales, but for 2021 also included License royalties.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Consumables

The Company is principally engaged in the sale of consumable products that utilize AC and chemical-based technologies to a broad range of customers, including coal-fired utilities, water treatment plants, and other diverse markets. The Company's proprietary technologies and associated product offerings provide purification solutions to enable our customers to reduce certain contaminants and pollutants and thus maximize utilization levels and improve operating efficiencies to meet the challenges of existing and potential regulations.

The sale of consumable products is comprised of a single performance obligation and is recognized at the point in time when control transfers and the Company's obligation has been fulfilled, which is when the product is shipped or delivered to a customer. Performance obligations for the sale of consumable products do not extend beyond one year.

The Company performs shipping and handling activities through the use of third-party shippers and such activities occur prior to a customer obtaining control of goods. As such, the Company accounts for these activities as fulfillment activities and not as separate performance obligations. Shipping and handling costs incurred by the Company in delivering products to customers are billed to customers and are included in the transaction price and included in the "Revenues - Consumables" line item in the Consolidated Statements of Operations. Costs for shipping and handling activities incurred by the Company are included in the "Consumables Cost of revenues, excluding depreciation and amortization" line item in the Consolidated Statements of Operations.

License royalties earned from Tinum Group

Through December 2021, the Company generated revenues from royalties ("M-45 Royalties") earned under a licensing arrangement ("M-45 License") of its M-45TM and M-45-PCTM emissions control technologies ("M-45 Technology") between the Company and Tinum Group, a related party. The Company recognized M-45 Royalties at a point in time based on the use of the M-45 Technology at certain RC facilities (the "M-45 Facilities") or through Tinum Group's use of licensed technology for rates in excess of amounts allowed for RC application. The amount of M-45 Royalties recognized was generally based on a percentage of pre-tax margins (as defined in the M-45 License) of the M-45 Facilities.

License royalties payable to Tinum Group

In December 2022, the Company and Tinum Group entered into an agreement (the "Tinum Group Royalty Agreement") whereby the Company pays Tinum Group a royalty (the "Tinum Group Royalty") for certain of the Company's sales of its M-ProveTM products after the expiration of the Section 45 Tax Credit Program (beginning January 1, 2022) to certain of the M-45 Facilities. The Tinum Group Royalty is calculated based on "Net Profit" (as defined in the Tinum Royalty Agreement) on the Company's sales of M-ProveTM product to certain of the M-45 Facilities. The Tinum Group Royalty Agreement is for an initial term of five years with automatic renewals of five years unless the Company and Tinum Group agree to terminate it.

For the year ended December 31, 2022, the Company recognized \$0.8 million of Tinum Group Royalties, which are included in the "Consumables cost of revenues, excluding depreciation and amortization" line item in the Consolidated Statement of Operations.

Practical Expedients and Exemptions

The Company does not disclose the value of unsatisfied performance obligations for contracts with an original expected length of one year or less.

Sales and other taxes that are collected concurrently with revenue-producing activities are excluded from revenue.

The Company generally expenses sales commissions when incurred, as the amortization period of the asset that the Company would have recognized is one year or less. These costs are recorded in sales and marketing expenses in the "General and administrative" line item in the Consolidated Statements of Operations.

Consumables Cost of Revenues

Consumables cost of revenues includes all labor, fringe benefits, subcontract labor, additive and coal costs, materials, equipment, supplies, travel costs and any other costs and expenses directly related to the Company's production of revenues.

Payroll and Benefits

Payroll and benefits costs include direct payroll, personnel related fringe benefits, sales and administrative staff labor costs and stock compensation expense. Payroll and benefits costs exclude direct labor included in Cost of revenues.

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Legal and Professional

Legal and professional costs include external legal, audit and consulting expenses.

General and Administrative

General and administrative costs include director fees and expenses, rent, insurance and occupancy-related expenses, bad debt expense, impairments and other general costs of conducting business.

Research and development costs are charged to expense in the period incurred and are reported in the "General and administrative" line item in the Consolidated Statements of Operations. For the years ended December 31, 2022 and 2021, the Company recorded research and development costs of \$0.4 million and \$0.4 million, respectively.

Asset Retirement Obligations

Asset retirement obligations ("ARO") are comprised of mine reclamation activities required under operating agreements related to the Five Forks Mine and Marshall Mine (as defined below) and are recognized when incurred and recorded as liabilities at fair value. An ARO is accreted over time through periodic charges to earnings. Accounting for AROs requires the Company to make estimates of future costs unique to a specific mining operation that the Company expects to incur to complete the reclamation and remediation work required to comply with existing laws and regulations. AROs are periodically adjusted to reflect changes in the estimated present value resulting from the passage of time and revisions to the estimates of either the timing or amount of the reclamation costs.

Five Forks Mine

For the Five Forks Mine ARO, a corresponding ARO asset is depreciated over its estimated life. Reclamation costs related to the Five Forks Mine are allocated to expense over the life of the related mine assets, and are periodically adjusted to reflect changes in the estimated present value resulting from the passage of time and revisions to the estimates of either the timing or amount of the reclamation costs. Remediation costs for the Five Forks Mine are accrued based on management's best estimate at the end of each period of the costs expected to be incurred. Such cost estimates may include ongoing care, maintenance and monitoring costs. Reclamation obligations are based on the timing of estimated spending for an existing environmental disturbance. On an annual basis, unless otherwise deemed necessary, the Company reviews its estimates and assumptions of the Five Forks Mine ARO.

The Company's mining activities at the Five Forks Mine are subject to various domestic laws and regulations governing the protection of the environment. The Company conducts its mining activities to protect public health and the environment and believes its operations are in compliance with applicable laws and regulations in all material respects. The Company has made, and expects to make in the future, expenditures to comply with such laws and regulations, but cannot predict the full amount of such future expenditures. Estimated future reclamation costs are based principally on current legal and regulatory requirements.

Marshall Mine (refer to Note 3)

Reclamation costs related to the Marshall Mine are largely based on a capped fee structure based on the initial estimate of the total costs of reclamation, which provides for certain contingencies that could increase or decrease the reclamation fee based on the reclamation agreement executed between the Company and the operator of the Marshall Mine. The timing of payments and actual reclamation costs may change and the Company accounts for these changes on a quarterly basis.

Income Taxes

The Company accounts for income taxes under the asset and liability method, which requires the recognition of deferred tax assets and liabilities for the expected future tax consequences of events that have been included in the financial statements. Under this method, deferred income taxes are provided for temporary differences between the financial reporting basis and tax basis of the Company's assets and liabilities and are tax-effected using enacted tax rates in effect for the year in which the temporary differences are expected to reverse. The effect of a change in tax rates on deferred tax assets and liabilities is recognized in operations in the period that includes the enactment date.

The Company maintains valuation allowances where it is more likely than not that all or a portion of deferred tax assets will not be realized. In making such a determination, the Company considers all available positive and negative evidence, including future reversals of existing taxable temporary differences, projected future taxable income, tax-planning strategies, and results of recent operations.

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The Company records uncertain tax positions on the basis of a two-step process whereby (1) the Company determines whether it is more-likely-than-not that the tax positions will be sustained on the basis of the technical merits of the position and (2) for those tax positions that meet the more-likely-than-not recognition threshold, the Company recognizes the amount of tax benefit that is more than 50 percent likely to be realized upon ultimate settlement with the related tax authority.

Stock-Based Compensation

Stock-based compensation expense is measured at the grant date based on the estimated fair value of the stock-based award and is generally expensed on a straight-line basis over the requisite service period and/or performance period of the award. Forfeitures are recognized when incurred. Stock-based compensation expense related to manufacturing employees and administrative employees is included in the "Consumables Cost of revenues, exclusive of depreciation and amortization" and "Payroll and benefits" line items, respectively, in the Consolidated Statements of Operations. Stock-based compensation expense related to non-employee directors and consultants is included in the "General and administrative" line item in the Consolidated Statements of Operations.

Dividends

When a sufficient amount of available earnings exists at the time of a dividend declaration, dividends are charged to Retained earnings when declared. If a sufficient amount of available earnings is not available, dividends declared are charged as a reduction to Additional paid-in capital.

Earnings (Loss) Per Share

Basic earnings (loss) per share is computed using the weighted-average number of shares of common stock outstanding during the reporting period. Diluted earnings per share is computed in a manner consistent with that of basic earnings per share, while considering other potentially dilutive securities. The treasury stock method is used to determine the dilutive effect of potentially dilutive securities.

Potentially dilutive securities consist of restricted stock awards ("RSAs") and contingent performance stock units ("PSUs") (collectively, "Potential dilutive shares"). Potential dilutive shares are excluded from diluted earnings (loss) per share when their effect is anti-dilutive. When there is a net loss for a period, all Potential dilutive shares are anti-dilutive and are excluded from the calculation of diluted loss per share for that period.

Each PSU represents a contingent right to receive shares of the Company's common stock, and the number of shares may range from zero to two times the number of PSUs granted on the award date depending upon the price performance of the Company's common stock as measured against a general index and a specific peer group index over requisite performance periods. The number of Potential dilutive shares related to a PSU is based on the number of shares of the Company's common stock, if any, that would be issuable at the end of the respective reporting period, assuming that the end of the reporting period is the end of the contingency period applicable to a PSU. See Note 12 for additional information related to PSUs.

The following table sets forth the calculations of basic and diluted earnings (loss) per common share:

<i>(in thousands, except per share amounts)</i>	Years Ended December 31,	
	2022	2021
Net (loss) income	\$ (8,917)	\$ 60,401
Basic weighted-average number of common shares outstanding	18,453	18,258
Add: dilutive effect of equity instruments	—	203
Diluted weighted-average shares outstanding	18,453	18,461
(Loss) earnings per share - basic	\$ (0.48)	\$ 3.31
(Loss) earnings per share - diluted	\$ (0.48)	\$ 3.27

For the years ended December 31, 2022 and 2021, 0.6 million and zero weighted-average equity instruments, respectively, were outstanding but were not included in the computation of diluted earnings per share because their effect would have been anti-dilutive.

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Use of Estimates

The preparation of the Company's consolidated financial statements in conformity with accounting principles generally accepted in the United States ("GAAP") requires the Company's management to make estimates and assumptions that affect the amounts reported in these financial statements and accompanying notes. Actual results could differ from those estimates.

Significant financial statement components in which the Company makes assumptions include:

- business combinations, including asset acquisitions;
- the carrying value of its long-lived assets;
- AROs; and
- income taxes, including the valuation allowance for deferred tax assets and assessment of uncertain tax positions.

Risks and Uncertainties

The Company is principally dependent on operations of its APT business and its cash on hand to provide liquidity over the near and long term. The Company's revenues, sales volumes, earnings and cash flows are significantly affected by prices of competing power generation sources such as natural gas and renewable energy. During periods of low natural gas prices, natural gas provides a competitive alternative to coal-fired power generation and therefore, coal consumption may be reduced, which in turn reduces the demand for the Company's products. However, during periods of higher prices for competing power generation sources, there is generally an increase in coal consumption and thus demand for the Company's products also increases.

In addition, coal consumption and demand for the Company's products are affected by the demand for electricity, which is higher in the warmer and colder months of the year. As a result, the Company's operating results are subject to seasonal variations whereby its revenues and cost of revenues tend to be higher in its first and third fiscal quarters compared to its second and fourth fiscal quarters. Abnormal temperatures during the summer and winter months may significantly affect coal consumption and impurities within various municipalities' water sources, and thus impact the demand for the Company's products.

Reclassifications

Certain balances have been reclassified from prior years to conform to the current year presentation. Such reclassifications had no effect on the Company's results of operations or financial position in any of the periods presented.

Segments

Operating segments are defined as components of an enterprise about which separate financial information is available that is evaluated regularly by a company's chief operating decision maker ("CODM"), or a decision-making group, in deciding how to allocate resources and in assessing financial performance. As of December 31, 2022, the Company's CODM was the Company's Chief Executive Officer, and the Company concluded that it had one reportable segment. Given the wind-down of Tinnium Group and Tinnium Services and the impact on the Company's financial statements, including the method in which the CODM allocates resources, the Company determined the historical Refined Coal segment no longer met the qualitative or quantitative criteria to be considered a reporting segment under GAAP. As a result, beginning January 1, 2022, the Company determined that it had one reportable segment and therefore has not provided segment reporting disclosures for both 2022 and 2021.

New Accounting Guidance

In June 2016, the FASB issued ASU 2016-13, *Financial Instruments - Credit Losses (Topic 326) Measurement of Credit Losses on Financial Instruments* ("ASU 2016-13"). The main objective of ASU 2016-13 is to provide financial statement users with more decision-useful information about the expected credit losses on financial instruments and other commitments to extend credit held by a reporting entity at each reporting date. To achieve this objective, the amendments in ASU 2016-13 replace the incurred loss impairment methodology in current GAAP with a methodology that reflects expected credit losses and requires consideration of a broader range of reasonable and supportable information to inform credit loss estimates. ASU 2016-13 is effective for "smaller reporting companies" (as defined by the Securities and Exchange Commission) for fiscal years beginning after December 15, 2022, including interim periods within those years, and must be adopted under a modified retrospective method approach. Entities may adopt ASU 2016-13 earlier as of the fiscal years beginning after December 15, 2018, including

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interim periods within those years. The Company will adopt ASU 2016-13 effective January 1, 2023 and this standard will not have a material impact on the Company's financial statements and disclosures.

Note 2 - Customer Supply Agreement

On September 30, 2020, the Company and Norit Activated Carbon - Americas (f/k/a Cabot Norit Americas, Inc.) ("Norit") entered into a supply agreement (the "Supply Agreement") pursuant to which the Company agreed to sell and deliver to Norit, and Norit agreed to purchase and accept from the Company certain lignite-based AC products ("Furnace Products"). The term of the Supply Agreement is for 15 years with 10-year renewal terms that are automatic unless either party provides three years prior notice of intention not to renew before the end of any term.

Under the Supply Agreement, Norit also reimburses the Company for certain capital expenditures incurred by the Company that are necessary to manufacture the Furnace Products. Reimbursements are comprised of revenues earned from capital expenditures incurred that will benefit both the Company and Norit (referred to as "Shared Capital") and revenues earned from capital expenditures incurred that will benefit Norit exclusively (referred to as "Specific Capital"). In the event that Norit ceases to make purchases under the Supply Agreement, Norit is obligated to pay the balance of any outstanding payments for Specific Capital.

Further, under the terms of the Supply Agreement, Norit was obligated to pay the Reclamation Reimbursement (defined in Note 3 below) to the Company for \$10.2 million of the Reclamation Costs (defined in Note 3 below), inclusive of interest.

On February 25, 2022, the Company received \$10.6 million in cash from Norit (the "Norit Payment") as a result of a change in control provision in the Supply Agreement (the "Change in Control"), which occurred as a result of the sale of Norit by its parent, Cabot Corporation. Under the Change in Control, the Company received from Norit full payment of all amounts outstanding under the Reclamation Reimbursement, payment of all unbilled amounts related to Specific Capital for expenditures incurred through February 28, 2022 and payment of \$0.8 million related to additional costs due to the third-party operator of Marshall Mine (the "Norit Reclamation Costs"). Under the Reclamation Contract (defined in Note 3 below), the Company was obligated to remit payment for the Norit Reclamation Costs to the third-party operator of Marshall Mine (defined in Note 3 below), and such payment was remitted in March 2022. The Change in Control did not impact any other provisions of the Supply Agreement.

As of February 25, 2022, the carrying value of the Reclamation Reimbursement was \$9.0 million, which included the principal balance, adjusted for accretion of interest and payments made to date. Under the Change in Control, the Company received \$8.5 million in cash for full payment of the outstanding Reclamation Reimbursement. The Company concluded that the cash proceeds received represented an early payment of a receivable based on a change in contractual terms and accounted for the difference between the cash proceeds received and the carrying amount of the Reclamation Reimbursement of \$0.5 million as a loss, which is included in the "Other income (expense)" line item in the Consolidated Statement of Operations for the year ended December 31, 2022.

Also, under the Change in Control, the Company received \$1.3 million in advance of revenue to be recognized in future periods related to Specific Capital and recorded this amount as deferred revenue, which is recognized ratably over the remaining contractual term as stipulated in the Supply Agreement.

Note 3 - Marshall Mine

Acquisition

Concurrently with the execution of the Supply Agreement, on September 30, 2020, the Company entered into an agreement to purchase from Norit 100% of the membership interests in Marshall Mine, LLC (the "Marshall Mine Acquisition") for a nominal purchase price. Marshall Mine, LLC owns a lignite mine located outside of Marshall, Texas (the "Marshall Mine"). The Company concluded that the Marshall Mine did not have any remaining economic reserves and independently determined to immediately commence activities to shutter it. Accordingly, on September 30, 2020, the Company and a third party entered into a reclamation contract (the "Reclamation Contract") for full reclamation of the Marshall Mine, which was expected to be completed by 2030. Under the terms of the Supply Agreement, Norit was obligated to reimburse the Company for \$10.2 million (the "Reclamation Reimbursement") for a portion of the total costs incurred under the Reclamation Contract (the "Reclamation Costs"), which was payable semi-annually over 13 years and inclusive of interest. As discussed in Note 2, on February 25, 2022 as part of the Change in Control, Norit fully paid the outstanding amount owed under the Reclamation Reimbursement and has no further liability related to the Marshall Mine.

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The Company accounted for the Marshall Mine Acquisition as an asset acquisition, and it included the acquisition of certain assets and assumption of certain liabilities as well as the incurrence of an obligation for the Reclamation Costs (the "Marshall Mine ARO"). As of December 31, 2022 and 2021, the carrying value of the Marshall Mine ARO was \$4.7 million and \$6.3 million, respectively.

As the Marshall Mine Acquisition represented a transaction with a customer of net assets acquired and liabilities assumed from Norit, the Company accounted for the excess of the fair value of liabilities assumed over assets acquired as upfront consideration transferred to a customer, Norit (the "Upfront Customer Consideration"), which was \$7.6 million. The amount of the Upfront Customer Consideration was also recognized net of the Reclamation Reimbursement. The total Upfront Customer Consideration is being amortized as a reduction to revenues on a straight-line basis over the expected 15-year contractual period of the Supply Agreement. Amortization of the Upfront Customer Consideration is approximately \$0.5 million per year.

As of June 30, 2021 and December 31, 2021, the Company significantly revised its estimate of future obligations owed for the reclamation of the Marshall Mine primarily based on scope reductions related to future reclamation requirements. As a result, the Company reduced the Marshall Mine ARO by \$1.9 million as of June 30, 2021 and \$0.8 million as of December 31, 2021 and for the year ended December 31, 2021 recognized a gain on change in estimate of \$2.7 million. This is included as "Gain on change in estimate, asset retirement obligation" in the Consolidated Statement of Operations for the year ended December 31, 2021.

Disposition

On September 2, 2022, (the "Agreement Date"), the Company entered into a Membership Interest Purchase Agreement (the "MM Purchase Agreement") with a third party (the "MM Buyer") to sell all of its membership interests in Marshall Mine, LLC to the MM Buyer (the "MM Sale") in exchange for a cash payment to be made by the Company to the MM Buyer of approximately \$2.4 million (the "MM Purchase Price") and the assumption by the MM Buyer of certain liabilities of Marshall Mine, LLC. The MM Buyer previously operated the Marshall Mine on behalf of Marshall Mine, LLC and is currently performing reclamation under the Reclamation Contract.

The MM Purchase Price is subject to adjustments for certain events that may occur during the period from the Agreement Date and the Closing Date (as defined below) as follows: (1) increased or reduced as agreed upon by the Company and the MM Buyer (collectively, the "Parties"); (2) increased or decreased by income, proceeds, receipts and credits earned with respect to the assets and operations of Marshall Mine, LLC between signing and closing of the MM Sale, (3) increased by any amounts that are, or under US GAAP should be, accrued as liabilities of Marshall Mine LLC as of the closing of the MM Sale, as more fully described in the MM Purchase Agreement; and (4) decreased by agreed amounts which escalate depending on the timing of closing if it occurs after January 1, 2023.

The obligations of the Parties to close the MM Sale (the "Closing Date") is subject to certain events, including (1) obtaining the approval of the Railroad Commission of Texas (the "Commission") for an operating permit in the name of the MM Buyer or an affiliate of the MM Buyer; and (2) the MM Buyer replacing the Company's surety bond with a reclamation performance bond, letter of credit or other form of security to which the MM Buyer or an affiliate of the MM Buyer is the principal that is satisfactory to the Commission. The MM Purchase Agreement may be terminated: (1) by mutual consent of the MM Buyer and the Company at any time prior to the Closing Date; (2) by the MM Buyer or the Company, if the Closing has not occurred within one year after the Agreement Date, unless the failure of the consummation of the Closing shall be due to the failure of the party wishing to terminate to comply in all material aspects with the agreements and covenants contained therein; (3) if there is a material breach (by either the MM Buyer or the Company) of any representation, warranty, covenant or agreement contained in the MM Purchase Agreement that is not cured within a specified time frame; and (4) if the MM Sale is prohibited by governmental authority in a final, non-appealable order or applicable law.

As of December 31, 2022, Marshall Mine, LLC had outstanding liabilities of approximately \$4.9 million, which the Company expects to be fully discharged upon payment of the MM Purchase Price. Because the Closing Date is uncertain, primarily due to a date uncertain for the Parties to receive approval of the MM Buyer's operating permit and surety bond by the Commission, the Company is unable to determine the accounting period in which it will recognize the MM Sale.

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The following tables summarize the assets and liabilities of Marshall Mine, LLC and their classification in the Company's Consolidated Balance Sheets:

<i>(in thousands)</i>	As of December 31,		Balance sheet component
	2022	2021	
Cash	\$ —	\$ 914	Current assets
Norit receivable, short-term	—	2,056	Current assets
Restricted cash	10,000	10,027	Non-current assets
Norit receivable, long-term	—	6,846	Non-current assets
Property and equipment, net	—	1,968	Non-current assets
	\$ 10,000	\$ 21,811	
Accounts payable and accrued liabilities	\$ 201	\$ 1,065	Current liabilities
Asset retirement obligation, short-term	548	1,775	Current liabilities
Asset retirement obligation, long-term	4,131	4,546	Non-current liabilities
	\$ 4,880	\$ 7,386	

Note 4 - Revenues

For the years ended December 31, 2022 and 2021, all material performance obligations related to revenues recognized were satisfied at a point in time. For the years ended December 31, 2022 and 2021, approximately 8% and 12%, respectively, of Consumables revenues were generated in Canada, and all other revenues were generated in the U.S.

Trade receivables

Trade receivables represent an unconditional right to consideration in exchange for goods or services transferred to a customer. The Company invoices its customers in accordance with the terms of the contract. Credit terms are generally net 30 - 45 days from the date of invoice. The timing between the satisfaction of performance obligations and when payment is due from the customer is generally not significant.

The following table shows the components of the Company's Receivables, net:

<i>(in thousands)</i>	As of December 31,	
	2022	2021
Trade receivables, net	\$ 13,789	\$ 10,476
Other receivables	75	—
Norit Receivable - current	—	2,146
Receivables, net	\$ 13,864	\$ 12,622

Contract liabilities

As discussed in Note 2, the Company received \$1.3 million in advance of revenue to be recognized in future periods related to Specific Capital and recorded this amount as deferred revenue in February 2022, which is recognized ratably over the remaining contractual term as stipulated in the Supply Agreement. As of December 31, 2022, total deferred revenue related to Specific Capital was \$1.0 million, of which the current portion is included in "Other current liabilities" and the long-term portion is included in "Other long-term liabilities" in the Consolidated Balance Sheet.

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Note 5 - Inventories, net

The following table summarizes the Company's inventories recorded at the lower of average cost or net realizable value as of December 31, 2022 and 2021:

<i>(in thousands)</i>	As of December 31,	
	2022	2021
Product inventory	\$ 9,479	\$ 4,901
Raw material inventory	8,349	2,949
	\$ 17,828	\$ 7,850

Note 6 - Leases

The Company's operating and finance lease right-of-use ("ROU") assets and liabilities as of December 31, 2022 and 2021 consisted of the following items (in thousands):

	Year ended December 31,	
	2022	2021
Operating Leases		
Operating lease right-of-use assets, net of accumulated amortization ⁽¹⁾	\$ 7,734	\$ 6,000
Operating lease obligations, current	\$ 2,724	\$ 2,157
Long-term operating lease obligations	5,133	4,178
Total operating lease obligation	\$ 7,857	\$ 6,335
Finance Leases		
Finance lease right-of-use assets, net of accumulated amortization ⁽²⁾	\$ 2,565	\$ 1,743
Finance lease obligations, current	\$ 1,131	\$ 1,011
Long-term finance lease obligations	3,450	3,152
Total finance lease obligations	\$ 4,581	\$ 4,163

(1) Operating lease assets are reported net of accumulated amortization of \$4.4 million and \$1.9 million as of December 31, 2022 and 2021, respectively.

(2) Finance lease assets are reported net of accumulated amortization of \$2.0 million and \$1.1 million as of December 31, 2022 and 2021, respectively.

Finance leases

ROU assets under finance leases are reported in the "Property, plant and equipment" line item, and finance lease liabilities are included in the "Current portion of long-term debt" and "Long-term debt, net of current portion" line items in the Consolidated Balance Sheets as of December 31, 2022 and 2021.

Interest expense related to finance lease liabilities and amortization of ROU assets under finance leases are included in the "Interest expense" and "Depreciation, amortization, depletion and accretion" line items respectively, in the Consolidated Statement of Operations for the years ended December 31, 2022 and 2021.

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Operating leases

ROU assets under operating leases are included in the "Other long-term assets" line item, and operating lease liabilities are included in "Other liabilities" and "Other long-term liabilities" line items, respectively, in the Consolidated Balance Sheets as of December 31, 2022 and 2021.

Lease expense for operating leases for the year ended December 31, 2022 was \$4.4 million, of which \$4.0 million is included in "Consumables cost of revenues, exclusive of depreciation and amortization" line item and \$0.4 million is included in "General and administrative" line item in the Consolidated Statement of Operations for the year ended December 31, 2022. Lease expense for operating leases for the year ended December 31, 2021 was \$4.0 million, of which \$3.5 million is included in the "Consumables cost of revenues, exclusive of depreciation and amortization" line item and \$0.5 million is included in the "General and administrative" line item in the Consolidated Statement of Operations for the year ended December 31, 2021.

Lease financial information as of and for the years ended December 31, 2022 and 2021 is provided in the following table:

<i>(in thousands)</i>	Year ended December 31,	
	2022	2021
Finance lease cost:		
Amortization of right-of-use assets	\$ 818	\$ 642
Interest on lease liabilities	307	288
Operating lease cost	3,436	2,430
Short-term lease cost	989	1,650
Variable lease cost ⁽¹⁾	19	40
Total lease cost	\$ 5,569	\$ 5,050
Other Information:		
Cash paid for amounts included in the measurement of lease liabilities:		
Operating cash flows from finance leases	\$ 307	\$ 288
Operating cash flows from operating leases	\$ 2,923	\$ 2,764
Financing cash flows from finance leases	\$ 1,246	\$ 1,190
Right-of-use assets obtained in exchange for new finance lease liabilities	\$ 1,641	\$ —
Right-of-use assets obtained in exchange for new operating lease liabilities	\$ 4,444	\$ 6,108
Weighted-average remaining lease term - finance leases	2.8 years	2.9 years
Weighted-average remaining lease term - operating leases	4.1 years	4.3 years
Weighted-average discount rate - finance leases	5.9 %	6.4 %
Weighted-average discount rate - operating leases	6.9 %	6.7 %

(1) Primarily includes common area maintenance, property taxes and insurance payable to lessors.

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The following table summarizes the Company's future lease payments under finance and operating leases as of December 31, 2022:

<i>(in thousands)</i>	Operating Lease Commitments	Finance Lease Commitments	Total Lease Commitments
2023	\$ 3,171	\$ 1,371	\$ 4,542
2024	1,798	1,199	2,997
2025	1,519	605	2,124
2026	1,519	372	1,891
2027	491	85	576
Thereafter	2,299	1,406	3,705
Total lease payments	10,797	5,038	15,835
Less: Imputed interest	(2,940)	(457)	(3,397)
Present value of lease payments	<u>\$ 7,857</u>	<u>\$ 4,581</u>	<u>\$ 12,438</u>

In November 2022, the Company executed a new lease for its corporate headquarters and primary laboratory commencing May 1, 2023 and expiring October 31, 2030. Total commitments under the lease include aggregate rental payments of \$3.3 million plus a pro rata portion of operating expenses related to the office and laboratory leased space, which is not included in the table above.

Note 7 - Commitments and Contingencies

Retention Agreements

On May 4, 2022, the Compensation Committee of the Board of Directors and the Board of Directors (the "Board") approved the amendment to retention agreements (the "Retention Agreements" and each a "Retention Agreement"), which had been executed in May 2021, between the Company and its executive officers and certain other key employees in order to maintain the Company's business operations while it pursues and executes on its strategic initiatives (the "Amended Retention Agreements"). Under the Amended Retention Agreements, employees will receive (i) 40% of the original amount agreed to in the Retention Agreements ("Retention Pay") in August 2022; (ii) 60% of the Retention Pay on the earliest of (1) the date the employee's employment is terminated without Cause or for Good Reason (as those terms are defined in the Retention Agreement or the employee's employment agreement, as applicable), (2) 90 days after a Transaction Date or a Change in Control (as those terms are defined in the Retention Agreement or the employee's employment agreement, as applicable), or (3) January 18, 2023; and (iii) an additional lump sum payment, ranging from 10% to 40% of the Retention Pay, will also be paid at the earliest of (1) the date the employee's employment is terminated without Cause or for Good Reason (as those terms are defined in the Retention Agreement or the employee's employment agreement, as applicable), (2) 90 days after a Transaction Date or a Change in Control (as those terms are defined in the Retention Agreement or the employee's employment agreement, as applicable), or (3) in January 2023.

In order to receive the Amended Retention Agreements payments, employees must remain employed at the Company through the dates above. In August 2022, the Company paid out \$1.0 million pursuant to the payment terms of the Amended Retention Agreements. As of December 31, 2022, the total cash payable pursuant to the Amended Retention Agreements was \$1.4 million, and is included in the "Other current liabilities" line item in the Consolidated Balance Sheet. This amount was paid in January 2023.

Surety Bonds and Restricted Cash

As the owner of the Marshall Mine, the Company is required to post a surety bond with a regulatory commission. As of December 31, 2022, the Company had posted a \$16.6 million surety bond (the "MM Surety Bond") which will remain in place until the Marshall Mine is fully reclaimed, and may be further reduced in amount from time to time as the Company progresses with its reclamation activities or eliminated if the MM Sale is consummated.

As the owner of the Five Forks Mine, the Company is required to post a surety bond with a regulatory commission. As of December 31, 2022, the Company had posted a \$7.5 million surety bond related to performance requirements associated with the Five Forks Mine.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

As of December 31, 2022, the Company posted cash collateral of \$10.0 million for both the Marshall Mine and Five Forks Mine as required by the Company's surety bond provider, which is reported as long-term restricted cash on the Consolidated Balance Sheets.

Tinum Group

The Company also has certain limited obligations contingent upon future events in connection with the activities of Tinum Group. The Company, NexGen Refined Coal, LLC ("NexGen") and two entities affiliated with NexGen have provided another Tinum Group owner with limited guarantees (the "Tinum Group Party Guarantees") related to certain losses it may suffer as a result of inaccuracies or breach of representations and covenants. The Company also is a party to a contribution agreement with NexGen under which any party called upon to pay on a Tinum Group Party Guaranty is entitled to receive contribution from the other party equal to 50% of the amount paid. No liability or expense provision has been recorded by the Company related to this contingent obligation as the Company believes that it is not probable that a loss will occur with respect to Tinum Group Party Guarantees.

Legal Proceedings

The Company is from time to time subject to various pending or threatened legal actions and proceedings, including those that arise in the ordinary course of its business. Such matters are subject to many uncertainties and outcomes, the financial impacts of which are not predictable with assurance and that may not be known for extended periods of time. The Company records a liability in its consolidated financial statements for costs related to claims, settlements, and judgments where management has assessed that a loss is probable and an amount can be reasonably estimated. There were no significant legal proceedings as of December 31, 2022.

Note 8 - Property, Plant and Equipment

The cost basis and accumulated depreciation of property, plant and equipment at December 31, 2022 and 2021 are summarized in the table below:

<i>(in thousands)</i>	Life in Years	As of December 31,	
		2022	2021
Land and land improvements	0-31	\$ 1,225	\$ 1,225
Plant and operating equipment	2-29	33,180	31,266
Furniture and fixtures	2-11	1,709	1,388
Machinery and equipment	3-10	2,116	697
Leasehold improvements	3-12	2,149	2,089
Construction in progress		6,373	1,190
		<u>46,752</u>	<u>37,855</u>
Less accumulated depreciation		(11,897)	(7,684)
Total property, plant and equipment, net		<u>\$ 34,855</u>	<u>\$ 30,171</u>

Included in plant and operating equipment as of December 31, 2022 and 2021 is mining equipment financed under various lease facilities, and obligations due under these facilities are included in finance lease obligations in the Consolidated Balance Sheets. The total amount recorded for ROU assets as of December 31, 2022 and 2021 related to finance lease obligations was \$2.6 million and \$1.7 million, respectively, net of accumulated depreciation of \$2.0 million and \$1.1 million.

Depreciation expense for the years ended December 31, 2022 and 2021 was \$4.9 million and \$5.5 million, respectively.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Note 9 - Supplemental Financial Information

Supplemental Balance Sheet Information

The following table summarizes the components of "Prepaid expenses and other current assets" and "Other long-term assets, net" as presented in the Consolidated Balance Sheets:

<i>(in thousands)</i>	As of December 31,	
	2022	2021
Prepaid expenses and other current assets:		
Prepaid expenses	\$ 2,570	\$ 2,571
Prepaid income taxes and income tax refunds	2,573	2,782
Other	2,395	1,308
	\$ 7,538	\$ 6,661
Other long-term assets:		
Right of use assets, operating leases, net	\$ 7,734	\$ 6,000
Spare parts, net	6,789	4,598
Upfront customer consideration ⁽¹⁾	6,475	6,982
Mine development costs, net	5,478	5,330
Mine reclamation asset, net	1,641	1,742
Intangible assets, net	847	1,237
Norit receivable	—	6,846
Equity method investments	—	2,391
Other long-term assets	1,683	1,745
	\$ 30,647	\$ 36,871

(1) See further discussion of Upfront Customer Consideration in Note 3.

Spare parts include critical spares required to support plant operations. Parts and supply costs are determined using the lower of cost or estimated replacement cost. Parts are recorded as maintenance expenses or capitalized in the period in which they are consumed or put into use.

Mine development costs include acquisition costs, the cost of other development work and mitigation costs related to the Five Forks Mine and are depleted over the estimated life of the related mine reserves, which is estimated to be 12 years as of December 31, 2022. The Company performs an evaluation of the recoverability of the carrying value of mine development costs to determine if facts and circumstances indicate that their carrying value may be impaired and if any adjustment is warranted. Mine reclamation asset represents the ARO asset related to the Five Forks Mine and is depreciated over its estimated life.

Highview Investment

Other includes a long-term investment (the "Highview Investment") in Highview Enterprises Limited ("Highview"), a London, England based developmental stage company specializing in power storage. The Company accounts for the Highview Investment as an investment recorded at cost, less impairment, plus or minus observable changes in price for identical or similar investments of the same issuer. Fair value measurements, if any, represent Level 2 measurements. The Highview Investment is evaluated for indicators of impairment such as an event or change in circumstances that may have a significant adverse effect on the fair value of the investment.

There were no changes to the carrying value of the Highview Investment for the years ended December 31, 2022 and 2021 as there were no indicators of impairment or observable price changes for equity issued by Highview. Since inception of Highview Investment, the Company has recognized \$2.2 million of cumulative impairment losses.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

The following table details the components of "Other current liabilities" and "Other long-term liabilities" as presented in the Consolidated Balance Sheets:

<i>(in thousands)</i>	As of December 31,	
	2022	2021
Other current liabilities:		
Current portion of operating lease obligations	\$ 2,724	\$ 2,157
Income and other taxes payable	1,039	807
Current portion of mine reclamation liability	548	1,775
Other current liabilities (1)	2,334	385
	\$ 6,645	\$ 5,124
Other long-term liabilities:		
Mine reclamation liabilities	\$ 7,985	\$ 8,184
Operating lease obligations, long-term	5,133	4,178
Other	733	—
	\$ 13,851	\$ 12,362

(1) Include in Other current liabilities is \$1.7 million related to the Repayment Agreement as defined in Note 10.

The Mine reclamation liability related to the Five Forks Mine is included in "Other long-term liabilities". The Mine reclamation liability related to Marshall Mine, which was assumed in the Marshall Mine Acquisition, is included in "Other current liabilities" and "Other long-term liabilities." The Mine reclamation liabilities represent AROs. Changes in the AROs were as follows:

<i>(in thousands)</i>	As of December 31,	
	2022	2021
Asset retirement obligations, beginning of year	\$ 9,959	\$ 21,447
Accretion	611	1,102
Liabilities settled	(2,071)	(10,010)
Changes due to scope and timing of reclamation	34	(2,580)
Asset retirement obligations, end of year	8,533	9,959
Less current portion	548	1,775
Asset retirement obligations, long-term	\$ 7,985	\$ 8,184

Supplemental Consolidated Statements of Operations Information

Gain on Change in estimate, asset retirement obligation

As discussed in Note 3, for the year ended December 31, 2021, recorded a gain on change in estimate of \$2.7 million based on its revisions in its estimate of future obligations owed for the reclamation of Marshall Mine.

The following table details the components of "Interest expense" in the Consolidated Statements of Operations:

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
Interest on Senior Term Loan	\$ —	\$ 206
Debt discount and debt issuance costs	—	945
453A interest	—	13
Other	336	326
Total Interest expense	\$ 336	\$ 1,490

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

The following table details the components of "Other" in the Consolidated Statements of Operations:

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
Interest income	\$ 239	\$ 326
Other	(84)	314
Total Other income	\$ 155	\$ 640

Note 10 - Equity Method Investments

Tinum Group, LLC

The following table summarizes the results of operations of Tinuum Group:

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
Gross profit	\$ 964	\$ 6,995
Operating, selling, general and administrative expenses	4,275	49,414
Loss from operations	(3,311)	(42,419)
Other income	1,231	9,726
(Income) loss attributable to noncontrolling interest	(874)	126,948
Net (loss) income available to members	\$ (2,954)	\$ 94,255
ADES equity earnings from Tinuum Group	\$ 3,455	\$ 61,837

As of December 31, 2022 and 2021, the carrying value of the Company's investment in Tinuum Group was zero as the cumulative amount of distributions received from Tinuum Group exceeded the Company's cumulative pro-rata share of Tinuum Group's net income available to Class A members. As a result, for the years ended December 31, 2022 and 2021, the Company recognized earnings from Tinuum Group's net income available to members that was different from its pro-rata share of Tinuum Group's net income available to members.

In December 2022, the Company, certain of the other owners of Tinuum Group (collectively, the "Tinuum Group Owners") and Tinuum Group executed the Distribution and Repayment Agreement (the "Repayment Agreement"). Under the terms of the Repayment Agreement, the Tinuum Group Owners received cash distributions (the "Distributions") equal to their percentage ownership and also agreed to be contractually liable for certain contingent liabilities of Tinuum Group (the "Tinuum Group Obligation") in amounts equal to their percentage ownership. In December 2022, the Company received its percentage share of the Distributions in the amount of \$2.0 million and became contractually liable for \$1.7 million of the Tinuum Group Obligation. The Company recorded the Company's contractual obligation of \$1.7 million as a liability in the "Other current liabilities" line item in the Consolidated Balance Sheet as of December 31, 2022, with the difference between the cash distribution of \$0.3 million recorded to equity method earnings for the year ended December 31, 2022. In the event that the Tinuum Group Obligation is discharged in its entirety or settled for an amount that is less than the total Tinuum Group Obligation, the Company will recognize future equity earnings for the difference in its contractual obligation amount and its pro rata share of the actual payment made by Tinuum Group, if any, for the Tinuum Group Obligation.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

The following table presents the Company's investment balance, equity earnings, cash distributions and cash distributions in excess of the investment balance for the years ended December 31, 2022 and 2021 (*in thousands*):

Description	Date(s)	Investment balance	ADES equity earnings (loss)	Cash distributions	Memorandum Account: Cash distributions and equity loss in (excess) of investment balance
Beginning balance	12/31/2020	\$ 3,387	\$ —	\$ —	\$ —
ADES proportionate share of net income from Tinum Group	2021 activity	40,058	40,058	—	—
Cash distributions from Tinum Group	2021 activity	(65,224)	—	65,224	—
Adjustment for current year cash distributions in excess of investment balance	2021 activity	21,779	21,779	—	(21,779)
Total investment balance, equity earnings (loss) and cash distributions	12/31/2021	\$ —	\$ 61,837	\$ 65,224	\$ (21,779)
ADES proportionate share of net loss from Tinum Group	2022 activity	(1,255)	(1,255)	—	(1,255)
Cash distributions from Tinum Group	2022 activity	(3,455)	—	3,455	(3,455)
Adjustment for current year cash distributions in excess of investment balance	2022 activity	4,710	4,710	—	—
Total investment balance, equity earnings and cash distributions	12/31/2022	\$ —	\$ 3,455	\$ 3,455	\$ (26,489)

Tinum Services, LLC

The following tables summarizes the results of operations of Tinuum Services:

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
Gross profit (loss)	\$ 1,065	\$ (68,465)
Operating, selling, general and administrative expenses	2,800	166,075
Loss from operations	(1,735)	(234,540)
Other income (expenses), net	1,159	3,830
Loss attributable to noncontrolling interest	323	246,094
Net (loss) income	\$ (253)	\$ 15,384
ADES equity earnings from Tinuum Services	\$ 85	\$ 6,952

Included in the Consolidated Statement of Operations of Tinuum Services for the years ended December 31, 2022 and 2021 were losses related to VIE entities that are consolidated within Tinuum Services. These losses do not impact the Company's equity earnings from Tinuum Services as 100% of those losses are attributable to a noncontrolling interest and eliminated in the calculations of Tinuum Services' net income attributable to the Company's interest.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

The following table presents the Company's investment balance, equity earnings, cash distributions and cash distributions in excess of the investment balance for the year ended December 31, 2022 (*in thousands*):

Description	Date(s)	Investment balance	ADES equity earnings	Cash distributions	Memorandum Account: Cash distributions and equity earnings in (excess) of investment balance
Beginning balance	12/31/2021	\$ 2,391	\$ —	\$ —	\$ —
ADES proportionate share of net loss from Tinum Services	2022 activity	(127)	(127)	—	—
Cash distributions from Tinum Services	2022 activity	(2,476)	—	2,476	—
Adjustment for current year cash distributions in excess of investment balance	2022 activity	212	212	—	(212)
Total investment balance, equity earnings and cash distributions	12/31/2022	\$ —	\$ 85	\$ 2,476	\$ (212)

The Company evaluates its equity method investments for impairment whenever events or changes in circumstances indicate that the carrying amount of the investment might not be recoverable. As of December 31, 2021, the Company concluded the carrying amount of its investment in Tinum Services was not fully recoverable and as a result, wrote down its investment in the amount of \$0.7 million, which is included in the "Earnings from equity method investments" line item in the Consolidated Statement of Operations for the year ended December 31, 2021.

Other

The following table details the carrying value of the Company's respective equity method investments included in the "Other long-term assets, net" line item on the Consolidated Balance Sheets and indicates the Company's maximum exposure to loss:

<i>(in thousands)</i>	As of December 31,	
	2022	2021
Equity method investment in Tinum Services	—	2,391
Total equity method investments	\$ —	\$ 2,391

The following table details the components of the Company's respective earnings or loss from equity method investments included in the "Earnings from equity method investments" line item in the Consolidated Statements of Operations:

<i>(in thousands)</i>	Year ended December 31,	
	2022	2021
Earnings from Tinum Group	\$ 3,455	\$ 61,837
Earnings from Tinum Services	85	6,952
Earnings (loss) from other	1	(63)
Earnings from equity method investments	\$ 3,541	\$ 68,726

The following table details the components of the cash distributions from the Company's respective equity method investments included as a component of cash flows from operating activities in the Consolidated Statements of Cash Flows. Distributions from equity method investees are reported in the Consolidated Statements of Cash Flows as "return on investment" in Operating cash flows until such time as the carrying value in an equity method investee company is reduced to zero. Thereafter, such distributions are reported as "distributions in excess of cumulative earnings" as a component of cash flows from investing activities.

Advanced Emissions Solutions, Inc. and Subsidiaries
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<i>(in thousands)</i>	Year ended December 31,	
	2022	2021
Distributions from equity method investees, return on investment		
Tinum Services	\$ 2,297	\$ 8,802
Tinum Group	—	14,142
	\$ 2,297	\$ 22,944
Distributions from equity method investees in excess of cumulative earnings		
Tinum Group	\$ 3,455	\$ 51,082
Tinum Services	179	—
Other	2	—
	\$ 3,636	\$ 51,082

Note 11 - Stockholders' Equity

The Company has two classes of capital stock authorized, common stock and preferred stock, which are described as follows:

Preferred Stock

The Company's Board of Directors (the "Board") is authorized to provide out of the unissued shares of Preferred Stock and to fix the number of shares constituting a series of Preferred Stock and, with respect to each series, to fix the number of shares and designation of such series, the voting powers, if any, the preferences and relative, participating, option or other special rights, if any, and any qualifications, limitations or restrictions thereof, of the shares of such series. As of December 31, 2022 and 2021, there were no shares of Preferred Stock designated or outstanding. See further discussion of subsequent preferred stock designation and issuance in Note 17.

Common Stock

Holders of common stock are entitled to one vote for each share held of record on all matters submitted to a vote of the stockholders. Additionally, holders of common stock are entitled to receive dividends when and if declared by the Board, subject to any statutory or contractual restrictions on payment of dividends and to any restrictions on the payment of dividends imposed by the terms of any outstanding shares of preferred stock.

Upon dissolution, liquidation or the sale of all or substantially all of the Company's assets, after payment in full of any amounts required to be paid to creditors and to the holders of preferred stock having liquidation preferences, if any, the holders of shares of common stock will be entitled to receive the Company's remaining assets for distribution on a pro rata basis.

Stock Repurchase Programs

In November 2018, the Board authorized the Company to purchase up to \$20.0 million of its outstanding common stock under a stock repurchase program (the "Stock Repurchase Program"), which was to remain in effect until December 31, 2019 unless otherwise modified by the Board. In November 2019, the Board authorized an incremental \$7.1 million to the Stock Repurchase Program and provided that it will remain in effect until all amounts are utilized or it is otherwise modified by the Board. As of December 31, 2022, the Company had \$7.0 million remaining under the Stock Repurchase Program.

Tax Asset Protection Plan

U.S. federal income tax rules, and Section 382 of the Internal Revenue Code in particular, could substantially limit the use of Section 45 tax credits and other tax assets if the Company experiences an "ownership change" (as defined in the Internal Revenue Code). In general, an ownership change occurs if there is a cumulative change in the ownership of the Company by "5 percent stockholders" that exceeds 50 percentage points over a rolling three-year period.

An entity that experiences an ownership change generally will be subject to an annual limitation on its pre-ownership change tax loss and credit carryforwards equal to the equity value of the entity immediately before the ownership change, multiplied by the long-term, tax-exempt rate posted monthly by the Internal Revenue Service ("IRS") (subject to certain adjustments). The annual limitation would be increased each year to the extent that there is an unused limitation in a prior year.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

On May 5, 2017, the Board approved the declaration of a dividend of rights to purchase Series B Junior Participating Preferred Stock for each outstanding share of common stock as part of a tax asset protection plan (the "TAPP"), which is designed to protect the Company's ability to utilize its net operating losses and tax credits. The TAPP is intended to act as a deterrent to any person acquiring beneficial ownership of 4.99% or more of the Company's outstanding common stock. During the years 2018-2022, we executed amendments to the TAPP (the "TAPP Amendments"), which amended the definition of "Final Expiration Date" under the TAPP to extend the duration of the TAPP and makes associated changes in connection therewith. The most recent TAPP Amendment was approved at our 2022 annual meeting of stockholders and extended the Final Expiration Date to the close of business on December 31, 2023.

Note 12 - Stock-Based Compensation

On May 16, 2022, the Company's stockholders approved the 2022 Omnibus Incentive Plan (the "2022 Plan"), which permits grants of awards to employees, directors and consultants. Awards may be in the form of options (both nonqualified stock options and incentive stock options), stock appreciation rights, restricted stock, restricted stock units, performance share units, and other stock-based awards and cash-based awards as described under the 2022 Plan. As of December 31, 2022, the Company has 1,403,043 shares of its common stock authorized for issuance under the 2022 Plan.

On June 20, 2017, the Company's stockholders approved the 2017 Omnibus Incentive Plan (the "2017 Plan"), which permits grants of awards to employees, directors and non-employees. Awards may be in the form of shares, rights to purchase restricted stock, bonuses of restricted stock, or other rights or benefits as described under the 2017 Plan. As of December 31, 2022, the Company has zero shares of its common stock authorized for issuance under the 2017 Plan.

Expense

RSA's - Restricted Stock Awards ("RSA's") are typically granted with vesting terms of three years. The fair value of RSAs is determined based on the closing price of the Company's common stock on the authorization date of the grant multiplied by the number of shares subject to the stock award. Compensation expense for RSAs is generally recognized over the vesting term on a straight-line basis.

PSU's - Performance share units ("PSU's") generally vest over three years and are based on the grantee's continuous service with the Company, performance measures or a combination of both. Each PSU represents a contingent right to receive shares of the Company's common stock if the Company meets certain performance measures over the requisite period.

Compensation expense is recognized for PSU awards on a straight-line basis over the vesting period based on the estimated fair value at the date of grant using a Monte Carlo simulation model.

Risk-free interest rate - The risk-free interest rate for PSUs granted during the period was determined by using a zero-coupon, U.S. Treasury rate for the periods that coincided with the expected terms listed above.

Dividends - As the PSUs granted receive dividend equivalent units, no discount was applied for any dividends declared.

Expected volatility - To calculate expected volatility, the historical volatility of the Company's common stock was used.

Performance period - The Company's performance period is based on the vesting term of the Company's PSU awards.

The Company recorded the following compensation expense related to the Stock Plans:

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
RSA expense	\$ 1,679	\$ 1,816
PSU expense	302	111
Total stock-based compensation expense	\$ 1,981	\$ 1,927

Stock-based compensation expense related to manufacturing employees and administrative employees is included in the "Consumables cost of revenues, excluding depreciation and amortization" and "Payroll and benefits" line items in the Consolidated Statements of Operations. Stock-based compensation expense related to non-employee directors and consultants is included in the "General and administrative" line item in the Consolidated Statements of Operations.

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Notes to Consolidated Financial Statements

The amount of unrecognized compensation cost as of December 31, 2022, and the expected weighted-average period over which the cost will be recognized is as follows:

	As of December 31, 2022	
<i>(in thousands)</i>	Unrecognized Compensation Cost	Expected Weighted- Average Period of Recognition (in years)
RSA expense	\$ 2,489	1.75
PSU expense	561	1.32
Total unrecognized stock-based compensation expense	\$ 3,050	1.43

Activity

Restricted Stock

A summary of activity of RSAs for the year ended December 31, 2022 is presented in the following table:

	Restricted Stock Awards	Weighted- Average Grant Date Fair Value RSA's
<i>(in thousands, except for share and per share amounts)</i>		
For the year ended December 31, 2022		
Non-vested at January 1, 2022	531,623	\$ 5.94
Granted	462,135	\$ 5.69
Vested	(267,973)	\$ 6.35
Forfeited	(72,823)	\$ 5.96
Non-vested at December 31, 2022	652,962	\$ 5.58

The weighted-average grant date fair value of RSAs granted or modified for the years ended December 31, 2022 and 2021 was \$5.69 and \$5.54, respectively. The total grant-date fair value of RSAs vested for the years ended December 31, 2022 and 2021 was \$1.7 million and \$1.5 million, respectively. The aggregate intrinsic value of non-vested RSAs outstanding as of December 31, 2022 was \$1.6 million.

PSUs

PSUs outstanding remain unvested until the third anniversary of their issuance date, at which time the actual number of vested shares will be determined based on the actual price performances of the Company's common stock relative to a broad stock index and a peer group performance index.

A summary of PSU activity for the year ended December 31, 2022 is presented in the table below:

	Units	Weighted- Average Grant Date Fair Value	Aggregate Intrinsic Value (in thousands)	Weighted- Average Remaining Contractual Term (in years)
For the year ended December 31, 2022				
PSU's outstanding, January 1, 2022	88,026	\$ 6.65		
Granted	60,565	9.59		
Vested / Settled	—	—		
Forfeited / Canceled	—	—		
PSU's outstanding, December 31, 2022	148,591	\$ 7.85	\$ 361	1.32

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Note 13 - Income Taxes

The provision for income taxes consists of the following:

<i>(in thousands, except for rate)</i>	Years Ended December 31,	
	2022	2021
Current portion of income tax expense:		
Federal	\$ (10)	\$ 2,741
State and other	219	2,326
	209	5,067
Deferred portion of income tax expense (benefit):		
Federal	—	9,527
State and other	—	1,078
	—	10,605
Total income tax expense	\$ 209	\$ 15,672
Effective tax rate	(2)%	21 %

Income tax expense (benefit) differed from the amount that would be computed by applying the U.S. statutory federal income tax rate of 21% to income before income taxes for the years ended December 31, 2022 and 2021 as follows:

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
Federal statutory rate	\$ (1,829)	\$ 15,975
State income taxes, net of federal benefit	115	2,283
Permanent differences	1,284	(680)
Tax credits	—	(443)
Valuation allowances	825	(1,290)
Changes in tax rates	(87)	(33)
Stock-based compensation	10	86
Return to provision and other true-ups	(109)	(40)
Other	—	(186)
Income tax expense	\$ 209	\$ 15,672

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Deferred income taxes are provided for the effects of temporary differences between the tax basis of an asset or liability and their reported amounts in the accompanying Consolidated Balance Sheets. These temporary differences result in taxable or deductible amounts in future years. Details of the Company's deferred tax assets and liabilities are summarized as follows:

<i>(in thousands)</i>	As of December 31,	
	2022	2021
Deferred tax assets		
Tax credits	\$ 86,125	\$ 86,097
Net operating loss carryforwards	2,892	2,388
Intangible assets	2,638	5,126
Employee related liabilities	1,968	1,971
Operating lease obligations	1,828	1,585
ARO, net of reimbursements	1,448	—
Research and development capitalization	739	—
Other investments	518	556
Equity method investments	325	1,584
Inventory	315	—
Interest limitations	77	—
Other	429	138
Total deferred tax assets	99,302	99,445
Less valuation allowance	(88,293)	(87,468)
Deferred tax assets	11,009	11,977
Less: Deferred tax liabilities		
Property and equipment and other	(7,702)	(8,203)
Right of use operating lease assets	(1,800)	(1,497)
Upfront customer consideration	(1,507)	(1,747)
Inventory	—	(197)
ARO, net of reimbursements	—	(333)
Total deferred tax liabilities	(11,009)	(11,977)
Net deferred tax assets	\$ —	\$ —

Accounting for income taxes requires that companies assess whether a valuation allowance should be recorded against a deferred tax asset based on an assessment of the amount of the deferred tax asset that is "more likely than not" to be realized. Valuation allowances are established, when necessary, to reduce deferred tax assets to the amount that is more likely than not to be realized.

The Company assesses a valuation allowance recorded against deferred tax assets at each reporting date. The determination of whether a valuation allowance is appropriate requires the evaluation of positive and negative evidence that can be objectively verified. Consideration must be given to all sources of taxable income available to realize a deferred tax asset, including, as applicable, the future reversal of existing temporary differences, future taxable income forecasts exclusive of the reversal of temporary differences and carryforwards, taxable income in carryback years and tax planning strategies. In estimating taxes, the Company assesses the relative merits and risks of the appropriate tax treatment of transactions taking into account statutory, judicial and regulatory guidance.

As of December 31, 2022, the Company concluded it is more likely than not the Company will not generate sufficient taxable income within the applicable net operating loss and tax credit carry-forward periods to realize any of its net deferred tax assets. For the year ended December 31, 2022, the Company increased a valuation allowance from December 31, 2021 by \$0.8 million and as of December 31, 2022, has a valuation allowance equal to 100% of its net deferred tax assets. In reaching this conclusion, the Company primarily considered forecasts of future taxable losses.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

The following table presents the approximate amount of federal and state net operating loss carryforwards and federal tax credit carryforwards available to reduce future taxable income, along with the respective range of years that the net operating loss and tax credit carryforwards would expire if not utilized:

<i>(in thousands)</i>	As of December 31,		
	2022	Beginning expiration year	Ending expiration year
Federal net operating loss carryforwards	\$ 467	Indefinite	Indefinite
State and other operating loss carryforwards	\$ 2,425	2026	2037
Federal tax credit carryforwards	\$ 86,125	2032	2041

The following table sets forth a reconciliation of the beginning and ending unrecognized tax positions on a gross basis for the years ended December 31, 2022 and 2021:

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
Balance as of January 1	\$ 54	\$ 946
Lapse of applicable statute of limitations	—	(892)
Balance as of December 31	\$ 54	\$ 54

For the years ended December 31, 2022 and 2021, the Company did not record any adjustments or recognize interest expense for uncertain tax positions. Interest and penalties related to uncertain tax positions are accrued and included in the "Interest expense" line item in the Consolidated Statements of Operations. Additional information related to the components of "Interest expense" is included in Note 9.

The Company files income tax returns in the U.S. and various states. The Company is no longer subject to U.S. federal examinations by tax authorities for years before 2019. The Company is generally no longer subject to state examinations by tax authorities for years before 2015.

Note 14 - Major Customers

Revenues from external customers who represent 10% or more of the Company's revenues for the years ended December 31, 2022 and 2021 were as follows:

Customer	Revenue Type	Years ended December 31,	
		2022	2021
A	Consumables	18%	14%
B	Consumables	11%	8%
C	Consumables	8%	10%
D	License royalties, related party	—%	14%

Note 15 - Related Party Transactions

Accounts Receivable

The following table shows the Company's receivable balance associated with related parties as of December 31, 2022 and 2021:

<i>(in thousands)</i>	As of December 31,	
	2022	2021
Receivable from related party - Tinum Group (1)	\$ —	\$ 2,481

(1) Represents amount due for M-45 Royalties.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Revenues

The following table shows the income recognized with related parties during the years ended December 31, 2022 and 2021:

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
License royalties, related party - Tinum Group	\$ —	\$ 14,368

The above Tinum Group royalties are included in the "License royalties, related party" line item in the Consolidated Statements of Operations.

Consumables Cost of Revenues

For the year ended December 31, 2022, the Company recognized \$0.8 million of Tinum Group Royalty expense, which is included in the "Consumables cost of revenues, exclusive of depreciation and amortization" line item in the Consolidated Statement of Operations.

Tinum Group Obligation

As of December 31, 2022, the Company had an outstanding liability of \$1.7 million related to its contractual amount due under the Tinum Group Obligation, which is included in the "Other current liabilities" line item in the Consolidated Balance Sheet. Refer to Note 10 for further discussion.

Note 16 - Defined Contribution Savings Plans

The Company sponsors a qualified defined contribution savings plan (the "401(k) Plan") that allows participation by eligible employees who may defer a portion of their gross pay. The Company makes contributions to the 401(k) Plan based on percentages of an employee's eligible compensation as specified in the 401(k) Plan, and such employer contributions are in the form of cash.

The following table presents the amount of the Company's contributions made to the 401(k) Plans:

<i>(in thousands)</i>	Years Ended December 31,	
	2022	2021
401(k) Plans employer contributions	\$ 552	\$ 479

Note 17 - Subsequent Events

Unless disclosed elsewhere in the notes to the Consolidated Financial Statements, the following is the significant matter that occurred subsequent to December 31, 2022.

Acquisition

On February 1, 2023 (the "Acquisition Date"), the Company entered into a securities purchase agreement (the "Purchase Agreement") with Arq Limited ("Arq Ltd."), a company incorporated under the laws of Jersey, pursuant to which the Company acquired all of the direct and indirect equity interests of Arq Limited's subsidiaries (the "Arq Acquisition," and hereafter referred to as "Arq") in exchange for consideration (the "Purchase Consideration") totaling \$31.2 million and consisting of (i) 3,814,864 shares of the Company's common stock, par value \$0.001 per share (the "Common Stock"), valued at \$12.4 million based on the closing price of the Common Stock on the Acquisition Date and (ii) 5,294,462 shares of the Company's Series A Convertible Preferred Stock, par value \$0.001 per share (the "Series A Preferred Stock" or the "Preferred Shares"), valued at \$18.8 million. The Company also incurred \$8.7 million in acquisition-related costs, which have been expensed as incurred.

Of the total Preferred Shares, 833,914 are being held in escrow (the "Escrow Shares") based on a contingent redemption feature, (the "Contingent Redemption Feature," as defined below). The fair value of the Preferred Shares issued was determined to be \$3.46 per Preferred Share on the Acquisition Date (the "Preferred Share Price") plus the value of the Contingent Feature related to the Escrow Shares. In connection with the issuance of the Series A Preferred Stock pursuant to the Purchase Agreement, the Company filed the Certificate of Designations of Preferred Stock for the Series A Preferred Stock (the "Certificate of Designations") with the Secretary of State of the State of Delaware. Under the Certificate of Designations, 8.9 million preferred shares were designated as Series A Preferred Stock.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Arq's principal office is located in London, United Kingdom, with additional offices located in Lexington and Corbin, Kentucky near its main production facility. Arq is an environmental technology company that has developed a process for transforming coal waste into a purified, microfine carbon powder ("Arq Powder") that can be used as an alternative to oil or in-ground mined coal to produce a range of carbon products. With the completion of the Arq Acquisition, the Company intends to first sell Arq Powder as a feedstock to produce high-quality AC for use in water and air purification markets.

Series A Preferred Stock

Each share of Series A Preferred Stock will be automatically converted into a share of Common Stock upon approval by the stockholders of the Company. Each share of Series A Preferred Stock is deemed to have an original issue price of \$4.00 per share (the "Original Issue Amount"). The number of shares of Common Stock issued upon conversion of each share of Series A Preferred Stock shall be equal to the product of (i) the sum of (A) the Original Issue Amount plus (B) an amount equal to the cumulative amount of the accrued and unpaid dividends on such share at such time divided by (ii) the Original Issue Amount, subject to adjustment.

Holders of the Series A Preferred Stock are entitled to receive cumulative dividends which will accrue quarterly on the last day of each applicable quarter (whether or not declared or funds for their payment are lawfully available) and will be payable quarterly, in arrears, on the earlier to occur of (a) the date any dividend is paid to holders of Common Stock with respect to such quarter and (b) 30 days after the end of each quarter (the "Series A Quarterly Dividend") at the rate per share of Series A Preferred Stock equal to the greater of (i) if the Company declares a cash dividend on the Common Stock with respect to such quarter, the amount of the cash dividend that would be received by a holder of Common Stock in which such share of Series A Preferred Stock would be convertible on the record date for such cash dividend and (ii) an annual rate (the "Rate") of 8.0% of the Original Issue Amount per annum compounded quarterly with respect to such quarter. The Rate will increase by 2.0% on the first day of the first quarter ending on or after the 635th day following the closing date of the first issuance of Series A Preferred Stock and on each subsequent anniversary of such date.

The Series A Quarterly Dividend is payable in cash or in additional shares of Series A Preferred Stock (the "Series A PIK Shares"), at the option of us. The number of Series A PIK Shares to be issued shall be determined by dividing (i) the Series A Quarterly Dividend payable with respect to all shares of Series A Preferred Stock held by a holder thereof by (ii) the aggregate Original Issue Amount of all shares of Series A Preferred Stock held by a holder thereof, and each fractional Series A PIK Share will be rounded to the nearest whole Series A PIK Share (with 0.5 of a share being rounded down to 0.0).

In the event of the Company's liquidation, dissolution or winding up, after payment or provision for payment of its debt and other liabilities, a holder of Series A Preferred Stock will receive a liquidating distribution equal to the amount of the cumulative accrued but unpaid dividends on each share of Series A Preferred Stock held by such holder. After the payment to the holders of Series A Preferred Stock of such liquidation preference, the holders of outstanding shares of Series A Preferred Stock will participate *pari passu* with the holders of Common Stock on an as-converted basis in any remaining distributions out of the Company's assets available for distribution to stockholders.

Holders of shares of Series A Preferred Stock will generally have no voting rights. However, the Company is restricted from taking certain actions without the written consent or affirmative vote of the holders of at least a majority of the then outstanding shares of Series A Preferred Stock, including, but not limited to, amending the Company's Certificate of Incorporation or Bylaws in a manner that adversely affects the rights of the Series A Preferred Stock or consummating a merger of the Company with or into another party or a sale of substantially of our assets.

If the approval by the stockholders of the Company of conversion of the Series A Preferred Stock has not been obtained, each outstanding share of Series A Preferred Stock will be redeemed by the Company on February 1, 2028 for cash, at a redemption price equal to the sum of (i) the product of (x) 140% and (y) the Original Issue Amount, plus (ii) an amount equal to the cumulative amount of accrued and unpaid dividends on such share of Series A Preferred Stock.

Acquisition Accounting

The Company accounted for the Arq Acquisition as an acquisition of a business as of the Acquisition Date. The fair value of the Purchase Consideration has been preliminarily allocated to the acquired assets and assumed liabilities based on their respective fair values as of the Acquisition Date. The Company also incurred \$8.7 million in acquisition-related costs (or transaction costs), which were expensed as incurred.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Under the terms of the Purchase Agreement, the Escrow Shares are being withheld pending a determination by the IRS that no tax withholding is required on the Purchase Consideration issued to Arq Ltd. (the "Arq Ltd. Tax Liability"). The Company has estimated the fair value of the potential Arq Ltd. Tax Liability at \$3.3 million. In the event that the IRS determines that no withholding is required by Arq Ltd. in connection with the Purchase Considered received by Arq Ltd., all of the Escrow Shares will be released and delivered to Arq Ltd. In the event that the IRS determines that any amount of withholding is required by Arq Ltd., the Company has agreed to redeem a sufficient number of Escrow Shares to fund the required payment to the IRS, and that number of Escrow Shares will be returned to the Company (the "Contingent Redemption Feature"). The number of Escrow Shares to be returned to the Company is equal to the required withholding amount divided by the Original Issue Amount, not to exceed a maximum of 833,914 Escrow Shares, and is equal to \$3.3 million based on the Original Issue Amount (the "Maximum Contingent Redemption Amount"). The fair value of the Escrow Shares is the Maximum Contingent Redemption Amount and the fair value of the non-escrowed Preferred Shares ("Non Escrow Shares") is the Preferred Share Price.

The Series A Preferred Stock contains a mandatory redemption feature in the event the Series A Preferred Stock is not converted prior to February 1, 2028. The Company has determined that both the Escrow Shares and the Non Escrow Shares do not meet the definition of mandatorily redeemable financial instruments as there is a substantive conversion feature, and are therefore not classified as liabilities. As both the Escrow Shares and Non Escrow Shares represent financial instruments that are redeemable for cash, SEC guidance mandates that preferred securities which are redeemable upon the occurrence of an event that is not solely within the control of the issuer be classified outside of permanent equity as "temporary equity." Accordingly, the Company has classified all of the Preferred Shares as temporary equity as of the Acquisition Date.

The following table provides the preliminary estimated fair values of the assets acquired and liabilities assumed as of the Acquisition Date:

<i>(in thousands)</i>	Preliminary Purchase Price Allocation	
Cash	\$	1,411
Inventories, net		340
Prepaid expenses and other current assets		1,889
Property, plant and equipment, net		39,199
Other long-term assets, net		19,460
Total Assets	\$	62,299
Accounts payable and accrued expenses	\$	9,323
Other current liabilities		—
Long-term debt, net of current portion		20,502
Other long-term liabilities		1,269
Total Liabilities	\$	31,094
Total Preliminary Purchase Price	\$	31,205

The intangible assets acquired are composed of Developed Technology and the estimated useful life is 10 years.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

Unaudited Pro Forma Financial Information

The following represents the pro forma effects of the Arq Acquisition as if it had occurred on January 1, 2021. The pro forma net (loss) income for each of the two years presented has been calculated after applying the Company's accounting policies in effect for those years. In addition, pro forma net (loss) income includes: (1) for the year ended December 31, 2021, an increase in Payroll and benefits for compensation expense of \$1.9 million payable to certain Arq employees triggered by change in control provisions in employment agreements as well as in employee severance agreements that is not recognized in the historical financial statements, assuming such amounts will be paid in cash; (2) for the year ended December 31, 2022, a decrease in depreciation and amortization resulting from fair value adjustments to Property, plant, equipment of \$0.9 million, and for the year ended 2021, an increase in depreciation and amortization resulting from fair value adjustments to Property, plant, equipment of \$1.1 million; (3) for each of the years ended December 31, 2022 and 2021, an increase in amortization resulting from fair value adjustments to Intangibles of \$0.8 million (4) for the year ended December 31, 2022 and 2021, increases to interest expense for: (a) the issuance of the Term Loan (as defined below) including stated interest and the amortization of the Term Loan's discount and issuance costs and (b) amortization of debt discount related to a fair value adjustment to an assumed term loan of Arq of \$2.3 million and \$2.2 million, respectively; (5) the removal of \$6.3 million of transaction costs incurred for the year ended December 31, 2022 but included as additional transaction costs for the year ended December 31, 2021; and (6) for the year ended December 31, 2021, the addition of \$5.9 million of transaction costs incurred for the period from January 1, 2023 through the Arq Acquisition Date, together with the income tax effects on (1) through (6). Since Arq had no revenues for the years ended December 31, 2022 or 2021, pro forma revenues are the same as the Company's reported revenues for those years.

<i>(in thousands)</i>	Years ended December 31,	
	2022	2021
Revenues	102,987	100,294
Net (loss) income	(66,297)	5,344

Subscription Agreements

As a requirement of the Purchase Agreement, and on February 1, 2023, the Company entered into subscription agreements with certain persons (the "Subscribers") pursuant to which the Subscribers subscribed for and purchased 3,842,315 shares of Common Stock for an aggregate price of \$15.4 million and at a price per share of \$4.00 ("PIPE Investment").

As a requirement of the Arq Acquisition, the Company appointed three new directors to the Board (the "New Directors"), each of whom was a director of Arq Ltd and is considered a related party as of the Acquisition Date. Each of the New Directors individually or through their affiliated entities were Subscribers in the PIPE Investment.

Loan Agreement

On August 19, 2022, the Company and CF Global Credit, LP ("CF Global") executed a commitment letter pursuant to which CF Global offered to provide a \$10 million term loan (the "Term Loan") to the Company, of which \$8.5 million was the net proceeds. The proceeds of the Term Loan are intended to be utilized for the general corporate purposes of the Company and its subsidiaries.

As a requirement of the Purchase Agreement, and on February 1, 2023 (the "Closing Date"), the Company, as borrower, certain of its subsidiaries, as guarantors, and CF Global, as administrative agent and lender, entered into the Term Loan upon execution of a Term Loan and Security Agreement (the "Loan Agreement"). Capitalized terms used herein but not otherwise defined have the meaning set forth in the Loan Agreement. CF Global is an affiliate of one of the Company's directors who was appointed on February 1, 2023 in conjunction with the Arq Acquisition. This director is considered a related party effective February 1, 2023.

The Term Loan has a term of 48 months and bears interest at a rate equal to either (a) Adjusted Term SOFR (subject to a 1.00% floor and a cap of 2.00%) plus a margin of 9.00% paid in cash and 5.00% paid in kind or (b) Base Rate plus a margin of 8.00% paid in cash and 5.00% paid in kind, which interest on the Term Loan in each case shall be payable (or capitalized, in the case of in kind interest) quarterly in arrears.

Advanced Emissions Solutions, Inc. and Subsidiaries
Notes to Consolidated Financial Statements

The Company is permitted to prepay the Term Loan at any time subject to the following prepayment premium: (i) prior to the twelve (12) month anniversary of the Closing Date, the Make-Whole Amount (as defined below), (ii) thereafter but prior to the thirty-six (36) month anniversary of the Closing Date, 2.00% of the outstanding principal amount of the Term Loan being repaid or prepaid or (iii) thereafter until the maturity date, 1.00% of the outstanding principal amount of the Term Loan being repaid or prepaid. The "Make-Whole Amount", with respect to any repayment or prepayment, is (i) an amount equal to all required interest payable (except for currently accrued and unpaid interest) on the aggregate principal amount of the Term Loan subject to such prepayment or repayment from the date of such prepayment or repayment through but excluding the date that is the first anniversary of the Closing Date calculated using an interest rate equal to (x) Adjusted Term SOFR for an interest period of one month in effect on the third U.S. Government Securities Business Day prior to such prepayment or repayment plus (y) 14.00% per annum and assuming all interest was paid in cash, plus (ii) a prepayment premium of 2.00% on the aggregate principal amount of the Term Loan subject to such prepayment or repayment.

The Term Loan is secured by substantially all of the assets of the Company and its subsidiaries (including those acquired in Arq Acquisition), subject to customary exceptions.

The Loan Agreement includes, among others, the following covenants: (1) beginning March 31, 2023 and as of the end of each fiscal quarter thereafter, the Company must maintain a minimum cash balance of \$5.0 million; (2) (x) as of December 31, 2023, for the fiscal year then ended, the Company must have a minimum annual revenue, on a consolidated basis, of \$70.0 million, (y) as of December 31, 2024, for the fiscal year then ended, the Company must have a minimum annual revenue, on a consolidated basis, of \$85.0 million and (z) for any fiscal year thereafter, the Company must have a minimum annual revenue, on a consolidated basis, of \$100.0 million; (3) (x) as of December 31, 2024, for the fiscal year then ended, the Company must have a minimum EBITDA of \$3.0 million and (y) for any fiscal year thereafter, the Company must have a minimum EBITDA of \$16.0 million; and (4) beginning after the fiscal quarter ending September 30, 2023, during an LTV Trigger Period, the Company must not exceed a loan to value (based on the consolidated total assets of the Company and its subsidiaries) ratio of 0.40:1.00.

In addition, in connection with the Loan Agreement and as consideration for the Term Loan, the Company agreed to issue to CF Global a warrant (the "Warrant") to purchase 325,457 shares of Common Stock. The Warrant has an exercise price of \$0.01 per share, subject to adjustment as set forth in the Warrant, is exercisable immediately and will expire on February 1, 2030. The terms of the Warrant do not allow for cash exercise, and the Warrant may only be exercised pursuant to the terms thereof.

One of the New Directors is a principal of CF Global and both this director and CF Global are considered related parties as of the Acquisition Date.

Termination of Transaction Agreement

In connection with entry into the Purchase Agreement described above, that certain Transaction Agreement, dated August 19, 2022, by and among Elbert Holdings, Inc., Arq Ltd. and the Company (the "Transaction Agreement") was terminated on February 1, 2023 pursuant to a termination agreement entered into by each of the parties to the Transaction Agreement. The Transaction Agreement would have provided, subject to its terms and conditions, for a business combination of Arq Ltd. and the Company. By virtue of the termination of the Transaction Agreement, the Transaction Agreement became void and of no further force or effect, with no liability of the part of any party to the Transaction Agreement.

Item 9. Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A. Controls and Procedures

Evaluation of Disclosure Controls and Procedures

As required by Rule 13a-15(b) under the Securities Exchange Act of 1934, as amended (the "Exchange Act"), we have evaluated, under the supervision of and with the participation of our management, including our principal executive officer and principal financial officer, the effectiveness of the design and operation of our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Exchange Act) as of the end of the period covered by this annual report. Our disclosure controls and procedures are designed to ensure that information required to be disclosed in the reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported, within the time periods specified in the SEC's rules and forms. Based upon this evaluation, our principal executive officer and principal financial officer concluded that our disclosure controls and procedures were effective as of December 31, 2022.

Management's Report on Internal Control over Financial Reporting

Management is responsible for establishing and maintaining adequate internal control over financial reporting as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act. Internal control over financial reporting is designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of consolidated financial statements for external purposes in accordance with generally accepted accounting principles. The Company's internal control over financial reporting includes those policies and procedures that:

1. Pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of our assets;
2. Provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the Company are being made only in accordance with authorizations of our management and directors; and
3. Provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of the Company's assets that could have a material effect on our financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Under the supervision of, and with the participation of our management, including the principal executive officer and principal financial officer, we conducted an evaluation of the effectiveness of our internal control over financial reporting based on the framework and criteria established in *Internal Control-Integrated Framework* in 2013, issued by the Committee of Sponsoring Organizations of the Treadway Commission. Based on this evaluation, our management concluded that our internal control over financial reporting was effective as of December 31, 2022.

Remediation Efforts Related to Past Material Weaknesses

As reported in Item 9A of Annual Report on Form 10-K for the fiscal year ended December 31, 2021, we identified deficiencies in the design and operation of controls over (1) the selection and application of accounting principles; (2) the monitoring of interpretative guidance of previously adopted accounting standards; and (3) the annual review of policies and procedures related to material accounts. These deficiencies in combination were evaluated as having a reasonable possibility that a material misstatement would not be prevented or detected on a timely basis resulting in a material weakness in our internal controls.

As of December 31, 2022, we have implemented additional processes and procedures for the monitoring of interpretative guidance on previously adopted accounting standards and our annual review of policies and process narratives related to material financial statement components that have been deemed effective for the fiscal year ended December 31, 2022.

Moss Adams LLP, an independent registered public accounting firm, has issued an attestation report on our internal control over financial reporting as of December 31, 2022 and its report is included herein.

Changes in Internal Control Over Financial Reporting

There has been no change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during the fourth quarter of 2022 that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Report of Independent Registered Public Accounting Firm

To the Shareholders and the Board of Directors of
Advanced Emissions Solutions, Inc.

Opinion on Internal Control over Financial Reporting

We have audited Advanced Emissions Solutions, Inc. and subsidiaries' (the "Company") internal control over financial reporting as of December 31, 2022, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"). In our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2022, based on criteria established in *Internal Control - Integrated Framework (2013)* issued by COSO.

We also have audited, in accordance with the standards of the Public Company Accounting Oversight Board (United States) ("PCAOB"), the consolidated balance sheets of Advanced Emissions Solutions, Inc. and subsidiaries as of December 31, 2022 and 2021, the related consolidated statements of operations, changes in stockholders' equity and cash flows for the years then ended, and the related notes (collectively referred to as the "consolidated financial statements") and our report dated March 8, 2023 expressed an unqualified opinion on those consolidated financial statements.

Basis for Opinion

The Company's management is responsible for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management Report on Internal Control over Financial Reporting included in Item 9A. Our responsibility is to express an opinion on the Company's internal control over financial reporting based on our audit. We are a public accounting firm registered with the PCAOB and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audit in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether effective internal control over financial reporting was maintained in all material respects. Our audit included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audit also included performing such other procedures as we considered necessary in the circumstances. We believe that our audit provides a reasonable basis for our opinion.

Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ Moss Adams LLP

Denver, Colorado
March 8, 2023

We have served as the Company's auditor since 2017.

Item 9B. Other Information

None.

Item 9C. Disclosure Regarding Foreign Jurisdictions that Prevent Inspections

None.

PART III

Item 10. Directors, Executive Officers, and Corporate Governance

The information required by this Item is incorporated by reference to our definitive proxy statement for the Annual Meeting of Stockholders to be filed within 120 days from December 31, 2022.

Item 11. Executive Compensation

The information required by this Item is incorporated by reference to our definitive proxy statement for the Annual Meeting of Stockholders to be filed within 120 days from December 31, 2022.

Item 12. Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

The information required by this Item concerning security ownership of certain beneficial owners and management is incorporated by reference to our definitive proxy statement for the Annual Meeting of Stockholders to be filed within 120 days from December 31, 2022, with the exception of the following information.

Securities Authorized for Issuance under Equity Compensation Plans

We have plans under which equity awards are authorized for grant or issuance as compensation to eligible employees, consultants, and members of the Board. Our stockholders have approved these plans. See Note 12 - Stock-Based Compensation included in Item 8 of this Report for further information about the material terms of our equity compensation plans. The following table is a summary of the shares of our common stock authorized for issuance under the equity compensation plans as of December 31, 2022:

Plan Category	Number of securities to be issued upon exercise of outstanding options, warrants and rights	Weighted-average exercise price of outstanding options, warrants and rights	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in the first column) (2)
Equity compensation plans approved by security holders (1)	—	\$ —	1,403,043
Equity compensation plans not approved by security holders	—	\$ —	—
Total	—		1,403,043

(1) Includes securities registered for issuance under the 2017 Omnibus Incentive Plan and 2022 Omnibus Incentive Plan.

(2) The number of securities is reduced by 652,962 shares of restricted common stock for which restrictions have not lapsed.

Item 13. Certain Relationships and Related Transactions and Director Independence

The information required by this Item is incorporated by reference to our definitive proxy statement for the Annual Meeting of Stockholders to be filed within 120 days from December 31, 2022.

Item 14. Principal Accountant Fees and Services

The information required by this Item is incorporated by reference to our definitive proxy statement for the Annual Meeting of Stockholders to be filed within 120 days from December 31, 2022.

Item 15. Exhibits and Financial Statement Schedules

- (a) The following consolidated financial statements of Advanced Emissions Solutions, Inc. are filed as part of this Report under Item 8:
- (1) Financial Statements – see Index to Consolidated Financial Statements in Item 8;
 - (2) Financial Statement Schedules – All schedules are omitted because the required information is not applicable or is not present in amounts sufficient to require submission of the schedule or because the information required is included in the Consolidated Financial Statements and Notes thereto; and
 - (3) Exhibits – Those exhibits required by Item 601 of Regulation S-K and by paragraph (b) below.
- (b) The following exhibits are filed as part of this Report or, where indicated, were heretofore filed and are hereby incorporated by reference:

Exhibit No.	Description	Form	File No.	Incorporated by Reference Exhibit	Filing Date
3.1	Second Amended and Restated Certificate of Incorporation of Advanced Emissions Solutions, Inc.	10-Q	000-54992	3.1	August 9, 2013
3.2	Conformed Copy of the Bylaws of Advanced Emissions Solutions, Inc., as amended	10-K	001-37822	3.2	March 12, 2018
3.3	Certificate of Designation, Preferences, and Rights of Series B Junior Participating Preferred Stock of Advanced Emissions Solutions, Inc	8-K	001-37822	3.1	May 8, 2017
3.4	Certificate of Designations of Series A Preferred Stock	8-K	001-37822	3.1	February 1, 2023
4.1	Form of Specimen Common Stock Certificate	10-Q	000-54992	4.1	August 9, 2013
4.2	Tax Asset Protection Plan dated as of May 5, 2017, by and between the Company and Computershare Trust Company, N.A., as rights agent, which includes as Exhibit B the Form of Rights Certificate	8-K	001-37822	3.2	May 8, 2017
4.3	First Amendment to Tax Asset Protection Plan dated as of April 6, 2018, by and between the Company and Computershare Trust Company, N.A., as rights agent	8-K	001-37822	4.2	April 11, 2018
4.4	Second Amendment to Tax Asset Protection Plan dated as of April 5, 2019, by and between the Company and Computershare Trust Company, N.A., as rights agent	8-K	001-37822	4.3	April 11, 2019
4.5	Third Amendment to Tax Asset Protection Plan dated as of April 8, 2020, by and between the Company and Computershare Trust Company, N.A., as rights agent	8-K	001-37822	4.4	April 9, 2020
4.6	Fourth Amendment to Tax Asset Protection Plan dated as of April 9, 2021, by and between the Company and Computershare Trust Company, N.A., as rights agent	8-K	001-37822	4.5	April 13, 2021
4.7	Fifth Amendment to Tax Asset Protection Plan dated as of March 15, 2022, by and between the Company and Computershare Trust Company, N.A., as rights agent	8-K	001-37822	4.6	March 16, 2022
4.8	Form of Warrant	8-K	001-37822	4.1	February 1, 2023
10.1	Advanced Emissions Solutions, Inc. 2017 Omnibus Incentive Plan**	8-K	001-37822	10.1	June 22, 2017
10.2	Advanced Emissions Solutions, Inc. 2022 Omnibus Incentive Plan**	8-K	001-37822	10.1	May 17, 2022
10.3	Rider to Employment Agreement dated August 27, 2014 between Heath Sampson and ADA-ES, Inc. and Advanced Emissions Solutions, Inc.**	8-K	000-54992	10.66	September 2, 2014
10.4	Form of Amendment No. 2 to Employment Agreement of Greg Marken**	10-Q	001-37822	10.1	August 6, 2018
10.5	Release of Claims and Separation Agreement dated as of June 30, 2020, between the Company and Heath Sampson	10-Q	001-37822	10.3	August 10, 2020

Exhibit No.	Description	Form	File No.	Incorporated by Reference Exhibit	Filing Date
10.6	<u>Advisor Services Agreement dated as of July 1, 2020, between the Company and Heath Sampson</u>	10-Q	001-37822	10.4	August 10, 2020
10.7	<u>Employment Agreement dated February 26, 2021 between the Company and Morgan Fields** , ***</u>	8-K	001-37822	10.1	March 3, 2021
10.8	<u>Form of Retention Agreement dated May 5, 2021 of Greg Marken and Morgan Fields** , ***</u>	10-Q	001-37822	10.4	May 10, 2021
10.9	<u>Retention Agreement dated May 5, 2021 between the Company and Joe Wong** , ***</u>	10-Q	001-37822	10.5	May 10, 2021
10.10	<u>Form of Amended Retention Agreement dated May 8, 2022 of Greg Marken, Morgan Fields and Joe Wong**</u>	10-Q	001-37822	10.1	May 9, 2022
10.11	<u>Employment Agreement dated May 7, 2020, between the Company and Christine Bellino** , ***</u>	8-K	001-37822	10.1	May 11, 2020
10.12	<u>Second Amended and Restated Operating Agreement of Clean Coal Solutions, LLC dated May 27, 2011, by and among Clean Coal Solutions, LLC, ADA-ES, Inc., GSFS Investments I Corp. and NexGen Refined Coal, LLC***</u>	10-Q/A	000-50216	10.33	September 28, 2011
10.13	<u>The First Amendment to the Second Amended and Restated Operating Agreement of Clean Coal Solutions, LLC, by and among Clean Coal Solutions, LLC, ADA-ES, Inc., GSFS Investments I Corp. and NexGen Refined Coal, LLC dated September 9, 2011</u>	10-Q	000-50216	10.89	November 14, 2011
10.14	<u>Second Amendment to the Second Amended and Restated Operating Agreement of Clean Coal Solutions, LLC by and among ADA-ES, Inc., NexGen Refined Coal, LLC and GSFS Investments I Corp. dated July 31, 2012</u>	10-Q	000-50216	10.59	November 9, 2012
10.15	<u>Contribution Agreement dated May 27, 2011 between ADA-ES, Inc. and NexGen Refined Coal, LLC</u>	10-Q	000-50216	10.87	August 12, 2011
10.16	<u>Amended and Restated Limited Liability Company Operating Agreement by and between ADA-ES, Inc., NexGen Refined Coal, LLC and Clean Coal Solutions Services, LLC dated November 20, 2013</u>	10-K	000-54992	10.38	February 29, 2016
10.17	<u>Amended and Restated License Agreement between ADA-ES, Inc. and Clean Coal Solutions, LLC dated October 30, 2009</u>	10-Q	000-50216	10.77	August 16, 2010
10.18	<u>First Amendment to the Amended and Restated License Agreement between ADA-ES, Inc. and Clean Coal Solutions, LLC dated as of August 4, 2010</u>	10-K	000-50216	10.81	March 28, 2011
10.19	<u>Second Amendment to Amended and Restated License Agreement by and between ADA-ES, Inc. and Clean Coal Solutions, LLC dated as of July 23, 2013***</u>	10-Q	000-54992	10.63	November 12, 2013
10.20	<u>Technology Sublicense Agreement between ADA-ES, Inc., Clean Coal Solutions, LLC, and GS RC Investments LLC dated June 29, 2010</u>	10-Q	000-50216	10.74	August 16, 2010
10.21	<u>Amendment to Technology Sublicense Agreement between ADA-ES, Inc., GS RC Investments, LLC, and Clean Coal Solutions, LLC dated November 21, 2011***</u>	10-K	000-54992	10.44	February 29, 2016
10.22	<u>Amendment #2 to Technology Sublicense Agreement between ADE-ES, Inc, GS RC Investments, LLC, and Clean Coal Solutions, LLC dated December 15, 2011</u>	10-K	000-50216	10.49	March 15, 2012
10.23	<u>M-45 Technology License Agreement between ADA-ES, Inc. and Clean Coal Solutions, LLC dated July 27, 2012***</u>	10-Q	000-50216	10.58	November 9, 2012
10.24	<u>Lignite Mining Agreement between Demery Resources Company, L.L.C. and Five Forks Mining, LLC dated as of June 29, 2009***</u>	10-K	001-37822	10.43	March 18, 2019
10.25	<u>First Amendment to Lignite Mining Agreement between Demery Resources Company, L.L.C. and Five Forks Mining, LLC, dated as of March 22, 2017***</u>	10-K	001-37822	10.44	March 18, 2019

Exhibit No.	Description	Form	File No.	Incorporated by Reference Exhibit	Filing Date
10.26	<u>Third Amendment to the Second Amended and Restated Operating Agreement of Tinuum Group, LLC, dated September 4, 2019***</u>	10-Q	001-37822	10.1	November 12, 2019
10.27	<u>Master Agreement for Supply of Furnace Products between ADA Carbon Solutions, LLC and Cabot Norit Americas, Inc.***</u>	8-K	001-37822	10.1	September 30, 2020
10.28	<u>Amended and Restated Lignite Mining Agreement among Caddo Creek Resources Company, L.L.C., ADA Carbon Solutions (Operations), LLC, Marshall Mine, LLC and The North American Coal Corporation dated as of September 30, 2020***</u>	8-K	001-37822	10.2	September 30, 2020
10.29	<u>Membership Interest Purchase Agreement between Caddo Creek Resources Company, L.L.C., as Buyer, and ADA Carbon Solutions (Operations), LLC, as Seller dated as of September 2, 2022***</u>	8-K	001-37822	10.2	September 6, 2022
10.3	<u>Fifteenth Amendment of 2013 Loan and Security Agreement by and among ADA-ES, Inc., Advanced Emissions Solutions, Inc., and BOK, NA d/b/a Bank of Oklahoma dated as of March 23, 2021</u>	8-K	001-37822	10.1	March 29, 2021
10.31	<u>Sixteenth Amendment of 2013 Loan and Security Agreement by and among ADA-ES, Inc., Advanced Emissions Solutions, Inc., and BOK, NA d/b/a Bank of Oklahoma dated as of July 29, 2021</u>	8-K	001-37822	10.1	July 29, 2021
10.32	<u>Securities Purchase Agreement, dated as of February 1, 2023, by and among Advanced Emissions Solutions, Inc. and Arq Limited***</u>	8-K	001-37822	2.1	February 1, 2023
10.33	<u>Registration Rights Agreement***</u>	8-K	001-37822	10.1	February 1, 2023
10.34	<u>Term Loan and Security Agreement among Advanced Emissions Solutions, Inc., as Debtor, Certain Subsidiaries of Debtor, as Guarantors, CF Global Credit, LP, as Administrative Agent, and the Lenders, from time to time party hereto, dated as of February 1, 2023***</u>	8-K	001-37822	10.2	February 1, 2023
10.35	<u>Loan Agreement among Community Trust Bank, Inc.; Corbin Project LLC, Arq Projects Holding Company LLC, Arq St. Rose LLC, Arq Corbin LLC and Arq Corbin Land LLC, dated January 27, 2021*, †</u>				
21.1	<u>Subsidiaries of Advanced Emissions Solutions, Inc.*</u>				
23.1	<u>Consent of Moss Adams LLP*</u>				
31.1	<u>Certification of Principal Executive Officer of Advanced Emissions Solutions, Inc. Pursuant to 17 CFR 240.13a-14(a) or 17 CFR 240.15d-14(a)*</u>				
31.2	<u>Certification of Principal Financial Officer of Advanced Emissions Solutions, Inc. Pursuant to 17 CFR 240.13a-14(a) or 17 CFR 240.15d-14(a)*</u>				
32.1	<u>Certification of Principal Executive Officer and Principal Financial Officer of Advanced Emissions Solutions, Inc. Pursuant to 18 U.S.C Section 1350, as Adopted Pursuant to Section 906 of the Sarbanes-Oxley Act of 2002*</u>				

Exhibit No.	Description	Form	File No.	Incorporated by Reference Exhibit	Filing Date
95	Mine Safety Disclosure Exhibit*				
101	The following financial statements, formatted in XBRL: (i) Consolidated Balance Sheets as of December 31, 2022 and 2021, (ii) Consolidated Statements of Operations for the Years ended December 31, 2022 and 2021, (iii) Consolidated Statements of Changes in Stockholders' Equity for the Years ended December 31, 2022 and 2021, (iv) Consolidated Statements of Cash Flows for the Years ended December 31, 2022 and 2021; and (v) Notes to the Consolidated Financial Statements. The information in Exhibit 101 is "furnished" and not "filed" as provided in Rule 401 of Regulation S-T.				

Notes:

- * – Filed herewith.
- ** – Management contract or compensatory plan or arrangement.
- *** – Portions of this exhibit have been omitted pursuant to a request for confidential treatment.
- † – Schedules and exhibits have been omitted pursuant to Item 601(a)(5) of Regulation S-K. The Company hereby undertakes to furnish supplemental copies of any of the omitted schedules and exhibits upon request by the SEC.

Filings for the Company were made under the name ADA-ES, Inc. (File No. 000-50216) prior to July 1, 2013, the effective date of our reorganization, and under the name Advanced Emissions Solutions, Inc. (File No. 000-54992) starting on July 1, 2013. Filings for the Company were made under the name Advanced Emissions Solutions, Inc. (File No. 001-37822) starting on July 6, 2016.

(c) Financial Statement Schedules. Please refer to Item 15(a) above.

Item 16. Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Exchange Act, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized.

Advanced Emissions Solutions, Inc.
(Registrant)

By /s/ Greg P. Marken
Greg P. Marken
Chief Executive Officer (Principal Executive Officer)

By /s/ Morgan Fields
Morgan Fields
Chief Accounting Officer (Principal Financial and Accounting Officer)

Date: March 8, 2023

Date: March 8, 2023

Pursuant to the requirements of the Exchange Act, this report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

By /s/ Richard Campbell-Breeden
Richard Campbell-Breeden, Director
Date: March 8, 2023

By /s/ Jeremy Blank
Jeremy Blank, Director
Date: March 8, 2023

By /s/ Carol Eicher
Carol Eicher, Director
Date: March 8, 2023

By /s/ Gilbert Li
Gilbert Li, Director
Date: March 8, 2023

By /s/ Julian McIntyre
Julian McIntyre, Director
Date: March 8, 2023

By /s/ J. Taylor Simonton
J. Taylor Simonton, Director
Date: March 8, 2023

By /s/ L. Spencer Wells
L. Spencer Wells, Director
Date: March 8, 2023



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