This management's discussion and analysis ("MD&A") is intended to assist readers in understanding the business environment, strategies, performance and risk factors of PyroGenesis Canada Inc. ("PyroGenesis", the "Company" or "we"). The MD&A provides the reader with a view and analysis, from the perspective of management, of the Company's financial results for the fourth quarter and for the year ended December 31, 2022. The MD&A has been prepared in accordance with National Instrument 51-102, Continuous Disclosure Requirements, and should be read in conjunction with the audited consolidated financial statements and related notes thereto of the Company for the year ended December 31, 2022. (the "2022 consolidated financial statements") and the Company's annual information form for the year ended December 31, 2022 (the "Annual Information Form").

The 2022 consolidated financial statements and MD&A have been reviewed by PyroGenesis' Audit Committee and were approved by its Board of Directors on March 30, 2023. The Board of Directors is responsible for ensuring that the Company fulfills its responsibilities for financial reporting and is ultimately responsible for reviewing and approving the MD&A. The Board of Directors carries out this responsibility principally through its Audit Committee. The Audit Committee is appointed by the Board of Directors and is comprised of independent directors. The Audit Committee reports its findings to the Board of Directors for its consideration when it approves the MD&A and consolidated financial statements for issuance to shareholders.

The following information takes into account all material events that took place up until March 30, 2023, the date on which the Company's Board of Directors approved this MD&A. Unless otherwise indicated, all amounts are presented in Canadian dollars. The Company's functional and reporting currency is the Canadian dollar.

Additional information regarding PyroGenesis is available on the System for Electronic Document Analysis and Retrieval ("SEDAR) at www.sedar.com, the Electronic Data Gathering, Analysis, and Retrieval system ("EDGAR") at www.sec.gov, and on the Company's website at www.pyrogenesis.com.

FORWARD-LOOKING STATEMENTS

This MD&A contains forward-looking statements and forward-looking information (collectively, "forward-looking statements") within the meaning of applicable securities legislation. All statements other than statements of historical fact contained in this MD&A are forward-looking statements, including, without limitation, the Company's statements regarding its products and services; relations with suppliers and clients; future financial position; business strategies; potential acquisitions; potential business partnering; litigation; and plans and objectives. In certain cases, forward-looking statements can be identified by the use of words such as "plans", "expects" or "does not expect", "is expected", "budget", "scheduled", "estimates", "forecasts", "intends", "anticipates" or "does not anticipate", or "believes", or variations of such words and phrases or state that certain actions, events or results "may", "could", "would", "might" or "will be taken", "occur" or "be achieved" and similar words or the negative thereof. Although management of the Company believes that the expectations represented in such forward-looking statements are reasonable, there can be no assurance that such expectations will prove to be correct.

In particular, this MD&A contains forward-looking statements that relate, but are not limited, to:

- the Company's business strategies, strategic objectives and growth strategy;
- the Company's current and future capital resources and the need for additional financing;
- the Company's ability to increase sales, including the results of the successful completion of the Company's current projects;
- management's expectation that the Company will achieve sustained annual growth and profitability, and that gross margins will increase resulting in a decrease in cost of sales as a percentage of revenue; and
- the Company's overall financial performance.

By their nature, forward-looking statements require assumptions and are subject to inherent risks and uncertainties including those discussed herein. In particular, forward-looking statements relating to future sales, growth and profitability are based on the assumption that current projects will be completed, and the Company will be awarded certain anticipated contracts pursuant to recent negotiations with, and statements made by, third parties. There is significant risk that predictions and other forward-looking statements will not prove to be accurate. Readers are cautioned to not place undue reliance on forward-looking statements made herein because a number of factors could cause actual future results, conditions, actions or events to differ materially from the targets, expectations, estimates or intentions expressed in the forward-looking statements.

Many factors could cause the Company's actual results, performance or achievements to be materially different from any future results, performance or achievements that may be expressed or implied by forward-looking statements, including, without limitation, risks and uncertainties relating to: the strength of the Canadian, US, European and Asian economies; operational, funding, and liquidity risks; unforeseen engineering and environmental problems; delays or inability to obtain required financing and/or anticipated contracts; risks associated with licenses, permits and regulatory approvals; supply interruptions or labour disputes; the impact of the Coronavirus (COVID-19) pandemic on our business and our operations; foreign exchange fluctuations and collection risk; competition from other suppliers, or alternative, less capital intensive, energy solutions; and risk factors described elsewhere under the heading "Risk Factors" in this MD&A and the Annual Information Form, and elsewhere in this MD&A and other filings that the Company has made and may make in the future with applicable securities regulatory authorities. We caution that the foregoing list of factors is not exhaustive, and that, when relying on forward-looking statements to make decisions with respect to the Company, investors and others should carefully consider these factors, as well as other uncertainties and potential events, and the inherent uncertainty of forward-looking statements.

Although the Company has attempted to identify significant factors that could cause actions, events or results to differ materially from those described in forward-looking statements, there may be other factors that cause actions, events or results not to be as anticipated, estimated or intended. There can be no assurance that forward-looking statements will prove to be accurate, as actual results and future events could differ materially from those anticipated in such statements. Accordingly, readers should not place undue reliance on forward-looking statements. Forward-looking statements are provided as of the date of this MD&A, and the Company assumes no obligation to update or revise such forward-looking statements to reflect new events or circumstances except as required under applicable securities laws.

The forward-looking statements contained herein are expressly qualified in their entirety by this cautionary statement. The forward-looking statements included in this MD&A are made as of the date of this MD&A or such other date specified herein.

BASIS OF PRESENTATION

For reporting purposes, we prepared the 2022 consolidated financial statements in accordance with International Financial Reporting Standards ("IFRS") as issued by the International Accounting Standards Board. The financial information contained in this MD&A was derived from the 2022 consolidated financial statements. Unless otherwise indicated, all references to "$" are to Canadian dollars. Unless otherwise indicated, all references to a specific "note" refer to the notes to the 2022 consolidated financial statements. Certain totals, subtotals and percentages throughout this MD&A may not reconcile due to rounding.

NON-IFRS MEASURES

This MD&A makes reference to certain non-IFRS measures. These measures are not recognized measures under IFRS and do not have a standardized meaning prescribed by IFRS and are therefore unlikely to be comparable to similar measures presented by other companies. Rather, these measures are provided as additional information to complement those IFRS measures by providing further understanding of our results of operations from management's perspective. Accordingly, these measures should not be considered in isolation nor as a substitute for analysis of our financial information reported under IFRS.

We use non-IFRS measures, including EBITDA and Modified EBITDA, both of which are not considered an alternative to income or loss from operations, or to net earnings or loss, in the context of measuring a company's performance. EBITDA is used by management in order to facilitate operating performance comparisons from period to period, to prepare annual operating budgets and forecasts and to determine components of management compensation. Management believes that EBITDA is used by investors as it provides supplemental measures of operating performance and thus highlight trends in our business that may not otherwise be apparent when relying solely on IFRS measures, and to compare the results of our operations with other entities with similar structures. Modified EBITDA is used my management as it brings additional clarity to operating performance, as it eliminates variations in the fair value of strategic investments, among others, which may be beyond the control of the Company. Management believes that investors use Modified EBITDA for similar purposes as management and to evaluate performance while adjusting for non-cash discretionary expenses. Modified EBITDA allows a more appropriate comparison to other companies whose earnings or loss is not adjusted by fair value adjustments from strategic investments. The Company also uses "*Backlog*" or "*Backlog of signed and/or awarded contracts*" interchangeably, as a non-IFRS measure. Backlog figures allow management of the Company to foresee and predict their future needs and resource planning. Management believes that "Backlog" is used by investors to evaluate the Company, their future performance and better understand the production capacity.

EBITDA: We define EBITDA as net earnings before net financing costs, income taxes, depreciation and amortization. See "Results of Operations - Reconciliation of Non-IFRS measures (EBITDA and Modified EBITDA)".

Modified EBITDA: We defined Modified EBITDA as EBITDA and adjust for non-cash items namely share-based payments expenses and Changes in fair value of strategic investments. See "Results of Operations - Reconciliation of Non-IFRS measures (EBITDA and Modified EBITDA)".

Backlog or **Backlog of signed and/or awarded contracts:** This measure is defined as contracts with customers, firm purchase order and contracts agreed between us and the customer, whereby we can determine the proceeds and the obligations to perform.

OVERVIEW

PyroGenesis Canada Inc. is a leader in the design, development, manufacture and commercialization of advanced plasma processes. We provide engineering and manufacturing expertise, cutting-edge contract research, as well as turnkey process equipment packages to the defense, metallurgical, mining, additive manufacturing (including 3D printing), oil & gas, and environmental industries. With a team of experienced engineers, scientists and technicians working out of our Montreal office and our 40,902 sq. ft. (3,800 m²) and 31,632 sq. ft. (2,940 m²) manufacturing facilities, PyroGenesis maintains its competitive advantage by remaining at the forefront of technology development and commercialization. Our core competencies allow PyroGenesis to lead the way in providing innovative plasma torches, plasma waste processes, high-temperature metallurgical processes, and engineering services to the global marketplace. Our operations are ISO 9001:2015 and AS9100D certified, having been ISO certified since 1997. Since our acquisition of Pyro Green-Gas (formerly AirScience Technologies Inc), we now offer technologies, equipment, and expertise in the area of biogas upgrading, and air pollution control. As a result, we have extended our presence to Italy and India, and this acquisition provides potential synergies with our current land-based waste destruction offerings. Our common shares are listed on the Toronto Stock Exchange (TSX) (Ticker Symbol: PYR), NASDAQ (Ticker Symbol: PYR) and the Frankfurt Stock Exchange (FSX) (Ticker symbol: 8PY).

This MD&A includes the accounts of the Company, Pyro Green-Gas Inc (including the subsidiaries in Italy and India) as well as Drosrite International LLC ("Drosrite International). Drosrite International is owned by a member of the Company's key management personnel and close family member of the Chief Executive Officer ("CEO") and controlling shareholder and is deemed for the purposes of the 2022 consolidated financial statements to be controlled by the Company. Unless otherwise stated, reference to subsidiaries in the 2022 consolidated financial statements and this MD&A shall include Drosrite International and/or Pyro Green-Gas Inc. All transactions and balances between the Company and its subsidiaries have been eliminated upon consolidation.

INFORMATION FROM CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS FOR THE QUARTERS AND YEARS ENDED DECEMBER 31:

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
Revenues	**$ 3,301,777**	$ 7,205,349	(54) %	**$ 19,013,503**	$ 31,068,350	(39)%
Cost of sales and services	**2,822,062**	5,902,560	(52) %	**10,869,616**	18,636,539	(42)%
Gross margin	**479,715**	1,302,789	(63) %	**8,143,887**	12,431,811	(34)%
Expenses						
Selling, general and administrative (not including share-based expenses)	**9,093,820**	7,071,471	29 %	**23,486,971**	17,474,390	34 %
Research and development	**740,603**	1,149,140	(36) %	**2,317,973**	2,535,987	(9)%
Total expenses (not including share-based expenses)	**9,834,423**	8,220,611	20 %	**25,804,944**	20,010,377	29 %
Net (loss) income from operations (not including share-based expenses)	**(9,354,708)**	(6,917,822)	35 %	**(17,661,057)**	(7,578,566)	133 %
Share-based expenses	**(1,316,221)**	(4,878,526)	(73) %	**(5,538,463)**	(9,762,745)	(43)%
Net loss from operations	**(10,670,929)**	(11,796,348)	(10) %	**(23,199,520)**	(17,341,311)	34 %
Changes in fair market value of strategic investments and financial expenses	**(264,231)**	(11,349,913)	(98) %	**(8,891,523)**	(21,830,588)	(59)%
Income taxes	**(189,069)**	(739,960)	(74) %	**75,984**	(739,960)	(110)%
Net loss	**$ (10,746,091)**	$ (22,406,301)	(52) %	**$ (32,167,027)**	$ (38,431,939)	16 %
Foreign currency translation gain (loss) on investments in foreign operations	**(72,664)**	3,444	2,210 %	**(3,042)**	3,444	188 %
Comprehensive loss	**$ (10,818,755)**	$ (22,402,857)	(52) %	**$ (32,170,069)**	$ (38,428,495)	(16)%
Loss per share						
Basic	**$ (0.06)**	$ (0.13)		**$ (0.19)**	$ (0.23)	
Diluted	**$ (0.06)**	$ (0.13)		**$ (0.19)**	$ (0.02)	
Modified EBITDA[1]	**$ (8,549,513)**	$ (6,522,877)	31 %	**$ (15,546,347)**	$ (6,182,695)	151 %

[1] See "Non-IFRS Measures"

INFORMATION FROM CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS FOR THE YEARS ENDED DECEMBER 31:

	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020
Revenues	$ **19,013,503**	$ 31,068,350	$ 17,775,029
Cost of sales and services	**10,869,616**	18,636,539	7,472,361
Gross margin	**8,143,887**	12,431,811	10,302,668
Expenses			
Selling, general and administrative (not including share-based expenses)	**23,486,971**	17,474,390	8,089,945
Research and development	**2,317,973**	2,535,987	(731,077)
Total expenses (not including share-based expenses)	**25,804,944**	20,010,377	7,358,868
Net (loss) income from operations (not including share-based expenses)	**(17,661,057)**	(7,578,566)	2,943,800
Share-based expenses	**(5,538,463)**	(9,762,745)	(4,244,608)
Net loss from operations	**(23,199,520)**	(17,341,311)	(1,300,808)
Changes in fair market value of strategic investments and financial expenses	**(8,891,523)**	(21,830,588)	44,102,624
Income taxes	**75,984**	(739,960)	1,033,412
Net income (loss) and comprehensive income (loss)	**$ (32,167,027)**	$ (38,431,939)	$ 41,768,404
Foreign currency translation gain (loss) on investments in foreign operations	**(3,042)**	3,444	—
Comprehensive income (loss)	**$ (32,170,069)**	$ (38,428,495)	$ 41,768,404
Earnings (loss) per share			
Basic	**$ (0.19)**	$ (0.23)	$ 0.28
Diluted	**$ (0.19)**	$ (0.23)	$ 0.27
Modified EBITDA[(1)]	**$ (15,546,347)**	$ (6,182,695)	$ 3,442,443

[1] See "Non-IFRS Measures"

SELECTED FINANCIAL INFORMATION

	Dec 31, 2022	Dec 31, 2021	Dec 31, 2020
Current assets	**27,448,182**	38,758,984	25,336,787
Non-current assets	**20,218,568**	31,011,693	49,194,591
Total assets	**$ 47,666,750**	$ 69,770,677	$ 74,531,378
Current liabilities	**25,797,473**	24,752,199	11,539,208
Non-current liabilities	**5,000,350**	4,249,724	3,569,064
Total liabilities	**$ 30,797,823**	$ 29,001,923	$ 15,108,272
Shareholders' equity	**$ 16,868,927**	$ 40,768,754	$ 59,423,106

FINANCIAL CONDITION

		December 31,		$ Change
		2022	2021	**2022vs2021**
Current Assets				
Cash and cash equivalents	$	**3,445,649**	$ 12,202,513	(8,756,864)
Accounts receivable		**18,624,631**	17,639,616	985,015
Costs and profits in excess of billings on uncompleted contracts		**1,051,297**	4,922,710	(3,871,413)
Inventory		**1,876,411**	887,590	988,821
Investment tax credits receivable		**276,404**	256,513	19,891
Income tax receivable		**14,169**	117,029	(102,860)
Current portion of deposits		**432,550**	1,328,452	(895,902)
Current portion of royalties receivable		**455,556**	311,111	144,445
Contract assets		**499,912**	375,789	124,123
Prepaid expenses		**771,603**	717,661	53,942
Total Current Assets	**$**	**27,448,182**	$ 38,758,984	(11,310,802)
Non-Current assets				
Deposits		**46,053**	248,756	(202,703)
Strategic investments		**6,242,634**	14,901,659	(8,659,025)
Property and equipment		**3,393,452**	3,712,937	(319,485)
Right-of-use-assets		**4,818,744**	5,765,993	(947,249)
Royalties receivable		**952,230**	947,543	4,687
Intangible assets		**2,104,848**	2,774,198	(669,350)
Goodwill		**2,660,607**	2,660,607	—
Total Non-Current Assets	**$**	**20,218,568**	31,011,693	(10,793,125)
Current Liabilities				
Bank indebtedness		**991,902**	—	991,902
Accounts payable and accrued liabilities		**10,115,870**	10,069,177	46,693
Billings in excess of costs and profits on uncompleted contracts		**9,670,993**	9,400,231	270,762
Current portion of term loans		**69,917**	83,004	(13,087)
Current portion of lease liabilities		**2,672,212**	2,934,236	(262,024)
Balance due on business combination		**2,088,977**	2,242,503	(153,526)
Income tax payable		**187,602**	23,048	164,554
Total Current Liabilities	**$**	**25,797,473**	24,752,199	1,045,274
Non-current Liabilities				
Lease liabilities		**2,861,482**	2,389,729	471,753
Term loans		**320,070**	107,901	212,169
Balance due on business combination		**1,818,798**	1,709,700	109,098
Deferred income taxes		**—**	42,394	(42,394)
Total Non-Current Liabilities	**$**	**5,000,350**	$ 4,249,724	750,626

Working capital, (expressed as current assets less current liabilities) varied year-over-year by $12.4 million, mainly a result of:

- a decrease of cash and cash equivalents of $8.8 million, explained in the section Summary of Cash Flows,
- an increase of $1.0 million of accounts receivable as the Company has reached the invoicing milestones on contracts in progress and offset by $4.15 million as a result of the increased allowance for credit loss,
- a decrease of $3.6 million in costs and profits in excess of billings on uncompleted contracts related to invoicing to customers upon successfully reaching contract milestones and such amounts are converted to accounts receivable and $0.3 million as a result of the allowance for credit loss on costs and profits in excess of billings on uncompleted contracts,

- an increase in $1 million of inventory as the Company continues to source materials for production and minimize the risks of transport delays and reduce lead time to its customers,
- a decrease of $0.9 million in current portion of deposits due to the timing of deposits with suppliers,
- an increase of $1 million in bank indebtedness, due to the usage of the credit facilities by Pyro Green-Gas and its Italian subsidiary, and
- an increase of $0.3 million in billings in excess of costs and profits in uncompleted contracts due to proceeds received on a contract signed close to the December 31, 2022, year-end.

Non-current assets varied year-over-year by $10.8 million, mainly a result of:

- a decrease of $8.7 million in strategic investments is mainly attributable to the $8.3 million decrease in the fair value of the common shares and warrants owned of HPQ Silicon Inc. and the net result of purchases and disposition of common share of HPQ Silicon Inc. during the year 2022,
- a decrease of property and equipment of $0.3 million due to annual depreciation including the assets under construction placed in service,
- a decrease of $0.9 million in right-of-use-assets due to timing of lease maturity dates, and
- a decrease of $0.7 million in intangible assets due to the amortization of the intangible asset from the 2021 business combination as well as the HP Torch and SPARC patents,

Non-current liabilities varied year-over-year by $0.8 million, mainly a result of:

Reimbursement of lease payments made in advance, an increase in the Economic Development Agency loan, and timing of the expected payments related to the balance due on business combination.

RESULTS OF OPERATIONS

Revenues

PyroGenesis recorded revenue of $3.3 million in the fourth quarter of 2022 ("Q4, 2022"), representing a decrease of $3.9 million compared with $7.2 million recorded in the fourth quarter of 2021 ("Q4, 2021"). Revenue for fiscal 2022 was $19.0 million a decrease of $12.1 million over revenue of $31.1 million compared to fiscal 2021.

Revenues recorded in fiscal 2022 were generated primarily from:

	Three months ended Dec 31		**% Change**	**Twelve months ended Dec 31**		**% Change**
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
High purity metallurgical grade silicon & solar grade silicon from quartz (PUREVAP™)	$ **824,894**	$ 938,211	(113,317)	$ **6,272,697**	$ 6,138,111	134,586
Aluminium and zinc dross recovery (DROSRITE™)	**504,760**	1,567,641	(1,062,881)	**1,912,807**	7,940,771	(6,027,964)
Development and support related to systems supplied to the U.S. Navy	**(468,812)**	845,621	(1,314,433)	**1,288,356**	7,522,809	(6,234,453)
Torch-related sales	**2,110,497**	651,661	1,458,836	**5,558,210**	2,084,511	3,473,699
Biogas upgrading and pollution controls	**86,593**	3,152,524	(3,065,931)	**3,347,443**	6,800,090	(3,452,647)
Other sales and services	**243,845**	49,691	194,154	**633,990**	582,058	51,932
Revenue	$ **3,301,777**	$ 7,205,349	(3,903,572)	$ **19,013,503**	31,068,350	(12,054,847)

Q4, 2022 revenues decreased by $3.9 million, mainly as a result of:

- PUREVAP™ related sales decreased by $0.1 million due to the project nearing its completion, with the phase of the project being mainly testing,
- DROSRITE™ related sales decreased by $1 million due to customer delays in funding for the construction of the onsite facility,

- Support services related to systems supplied for the US Navy decreased by $1.3 million due to a revision in the cost budget which effects the revenue recognized by percentage completion. As of December 31, 2022 the customer has not provided a firm purchase order for the change in project scope, however, the Company expects to do so in 2023 and
- Biogas upgrading and pollution controls related sales decreased by $3.1 million due to clients requesting additional modifications prior to installation and commissioning, as well as continuous testing to achieve desired results.

Fiscal 2022 revenues decreased by $12.1 million, mainly as a result of:

- DROSRITE™ related sales decreased by $6.0 million due to client delays in funding for the construction of the onsite facility,
- Support services related to systems supplied for the US Navy decreased by $6.2 million due to the project nearing its completion with remaining milestones based largely on inspections and shipment of the equipment, as well as, additional out of scope work costs incurred and not yet reflected in receipt of purchase order modifications, and
- Biogas upgrading and pollution controls decreased by $3.4 million due to the continuous effort in reaching desired results in order to advance to final steps, such as, commissioning.

PUREVAP™ related sales includes revenue from the sale of technologies in the amount of $3.6 million ($3.3 million in 2021). See note 7 to the 2022 consolidated financial statements.

As of March 30, 2023, revenue expected to be recognized in the future related to backlog of signed and/or awarded contracts is $32.4 million. Revenue will be recognized as the Company satisfies its performance obligations under long-term contracts, which is expected to occur over a maximum period of approximately 3 years.

Cost of Sales and Services

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
Employee compensation	**$ 1,014,363**	$ 769,322	32 %	**$ 3,668,261**	$ 2,650,739	38 %
Subcontracting	**113,610**	210,848	(46)%	**1,323,092**	872,933	52 %
Direct materials	**1,005,318**	4,498,835	(78)%	**4,698,982**	14,252,205	(67) %
Manufacturing overhead & other	**265,579**	434,778	(39)%	**1,371,462**	1,111,975	23 %
Foreign exchange charge on materials	**224,880**	(306,918)	(173)%	**(999,548)**	(568,531)	76 %
Investment tax credits	**(23,440)**	(65,326)	(64)%	**(70,663)**	(148,695)	(52) %
Amortization of intangible assets	**221,752**	361,021	(39)%	**878,030**	465,913	88 %
Total Cost of Sales and Services	**$ 2,822,062**	$ 5,902,560	(52)%	**$ 10,869,616**	$ 18,636,539	(42) %

Gross Margin

	Three months ended Dec 31		Twelve months ended Dec 31	
	2022	2021	**2022**	2021
Revenues	**$ 3,301,777**	$ 7,205,349	**$ 19,013,503**	$ 31,068,350
Cost of Sales and Services	**2,822,062**	5,902,560	**10,869,616**	18,636,539
Gross Margin	**$ 479,715**	$ 1,302,789	**$ 8,143,887**	$ 12,431,811
Gross Margin %	**14.5 %**	18.1 %	**42.8 %**	40.0 %

Cost of sales and services was $2.8 million in Q4, 2022, representing a decrease of 52% compared to $5.9 million in Q4, 2021, primarily due to decreases in subcontracting $0.1 million (Q4, 2021 - $0.2 million), direct materials $1.0 million (Q4, 2021 - $4.5 million), manufacturing overhead & other $0.3 million (Q4, 2021 - $0.4 million), foreign exchange charge on materials $0.2 million, (Q4, 2021 – ($0.3 million), which is largely due to the decrease in product and service-related revenues, as well as being negatively impacted by the foreign exchange charge on materials, and a decrease in investment tax credits ($0.02 million) due to a lower levels of qualifying projects.

Fiscal 2022, cost of sales and services was $10.9 million, representing a decrease of 42% compared to $18.6 million in 2021, primarily due to the decrease of product and service-related revenues in the Company and its subsidiaries. Decreases in direct materials $4.7 million (2021 - $14.3 million) and investment tax credits ($0.07 million) (2021 – ($0.1 million)), were offset by the increases in employee compensation $3.7 million (2021 - $2.6 million), subcontracting $1.3 million (2021 - $0.9 million), manufacturing overhead & other $1.4 million (2021 - $1.1 million), foreign exchange charge on materials ($1.0 million) (2021 – ($0.6 million), totaling an increase of $5.4 million compared to $4.1 million in 2021. The increase in employee compensation, subcontracting, and manufacturing overhead & other is primarily related to an increase in labour intense projects, which require additional engineering hours, as well as specific subcontracting work related to equipment capacity improvements, mainly for torch-related sales, and the increase to manufacturing and other was due to higher utility costs, and equipment rentals, such as cranes and power generators. These increases were offset by the decrease in direct materials and by the foreign exchange charge on materials.

The gross margin for Q4, 2022 was $0.5 million or 14.5% of revenue compared to a gross margin of $1.3 million or 18.1% of revenue for Q4, 2021, the decrease in gross margin was mainly attributable to the negative impact in foreign exchange charge on materials of $0.5 million.

Fiscal 2022, gross margin was $8.1 million or 42.8% of revenue compared to a gross margin of $12.4 million or 40% for fiscal 2021. As a result of the type of contracts being executed, the nature of the project activity, as well as the composition of the cost of sales and services, the mix between labour, materials and subcontracts may be significantly different. The cost of sales and services for 2022 and 2021 are in line with management's expectations and with the nature of revenue.

Investment tax credits recorded against cost of sales are related to projects that qualify for tax credits from the provincial government of Quebec. Qualifying tax credits decreased in Q4, 2022 to $0.02 million compared to $0.07 million for Q4,2021. In 2022, $0.07 million compared to $0.1 million in 2021. The decrease in fiscal 2022 is primarily related to less contracts being eligible for qualifying tax credits.

The amortization of intangible assets for Q4, 2022 was $0.2 million compared to $0.4 million for Q4, 2021. In 2022, the amortization of intangible assets was $0.9 million compared to $0.5 million for 2021. The increase in 2022, relates mainly to the intangible assets in connection with the Pyro Green-Gas acquisition, patents and deferred development costs. These expenses are non-cash items and will be amortized over the duration of the patent lives.

Selling, General and Administrative Expenses

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
Employee compensation	**$ 2,458,487**	$ 4,648,952	(47)%	**$ 8,094,226**	$ 8,664,603	(7) %
Share-based expenses	**1,316,221**	4,878,526	(73)%	**5,538,463**	9,762,745	(43) %
Professional fees	**1,473,164**	998,098	48 %	**5,129,384**	3,884,734	32 %
Office and general	**454,881**	125,224	263 %	**1,154,327**	609,353	89 %
Travel	**79,875**	37,193	115 %	**283,142**	114,206	148 %
Depreciation of property and equipment	**157,011**	102,024	54 %	**603,894**	356,103	70 %
Depreciation of ROU assets	**156,362**	166,223	(6)%	**635,828**	570,411	11 %
Investment tax credits	**(7,500)**	(9,007)	(17)%	**(30,000)**	(32,486)	(8) %
Government grants	**(67,268)**	(32,612)	106 %	**(204,791)**	(76,845)	166 %
Other expenses	**(91,191)**	1,035,375	(109)%	**3,340,961**	3,384,311	(1) %
Bad debt provision	**4,480,000**	—	100 %	**4,480,000**	—	100 %
Total selling, general and administrative	**$ 10,410,042**	$ 11,949,996	(13)%	**$ 29,025,434**	$ 27,237,135	7 %

Included within Selling, General and Administrative expenses ("SG&A") are costs associated with corporate administration, business development, project proposals, operations administration, investor relations and employee training.

SG&A expenses for Q4, 2022 were $10.4 million, representing a decrease of 13% compared to $11.9 million for Q4, 2021. The decrease is mainly a result of employee compensation decreasing to $2.5 million (Q4, 2021 – 4.6 million), due to lower levels of eligible commissions and bonuses, a decrease in share-based compensation of $3.6 million (a non- cash expense related to a Q4 2021 grant not repeated in 2022), and a decrease in other expenses, which in Q4 2021 comprised of insurances, taxes, interest, and bank charges. Professional fees for Q4 2022 were greater due to an increase in legal fees, accounting fees, investor relation fees and patent expenses. In addition, in Q4 2022 a credit loss of $4.5 million was recorded related to collection of accounts receivable, also a non-cash expense.

SG&A expenses for fiscal 2022 were $29.0 million, representing an increase of 7% compared to $27.2 million for fiscal 2021. The SG&A expense now includes those of Pyro Green-Gas for the full year, versus approximately 5 months for fiscal 2021, increased due to the following:

i) a decrease of $0.6 million in employee compensation primarily due to a decrease in commissions and bonuses,
ii) an increase of $1.3 million for professional fees, primarily due to an increase in consulting fees, accounting and audit fees, legal fees, investor relation fees and public listing fees,
iii) an increase of $0.5 million in office and general expenses, is primarily due to information technology expenses including those related to the new ERP system,
iv) depreciation on property and equipment increased by $0.2 million due to higher amounts of property and equipment being depreciated,
v) Bad debt provision increased by $4.5 million, of which $4.2 million is attributable to accounts receivable and $0.3 million related to costs and profits in excess of billings on uncompleted contracts.

Separately, share-based payments decreased to $1.3 million for Q4, 2022 (Q4, 2021 - $4.9 million) and decreased to $5,538,463 in 2022, compared to $9,762,745 over the same period in 2021. This was directly impacted by the vesting structure of the stock option plan with options vesting between 10% and 100% on the grant date requiring an immediate recognition of that cost.

Depreciation on Property and Equipment

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
Depreciation of property and equipment	**$ 157,011**	$ 102,024	54 %	**$ 603,894**	$ 356,103	70 %

During the three months ended December 31, 2022, deprecation on property and equipment increased to $0.2 million compared to $0.1 million for the same period in the prior year. The 54% increase is due to the equipment under construction placed in service.

The depreciation on property and equipment increased to $0.6 million in 2022, compared to $0.4 million in 2021. The 70% increase is due to higher amounts of property and equipment being depreciated.

Research and Development ("R&D") Expenses

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
Employee compensation	**$ 201,756**	$ 186,677	8 %	**$ 814,334**	$ 777,870	5 %
Investment tax credits	**(22,637)**	757,946	103 %	**(68,771)**	684,709	110 %
Subcontracting	**50,590**	14,356	252 %	**142,027**	135,066	5 %
Materials and equipment	**288,315**	136,982	110 %	**1,033,235**	912,456	13 %
Other expenses	**222,579**	68,956	223 %	**397,148**	175,461	126 %
Sub-total before government grants	**$ 740,603**	$ 1,164,917	(36)%	**$ 2,317,973**	$ 2,685,562	(14) %
Government grants	**—**	(16,115)	(100)%	**—**	(149,575)	(100) %
Total net R&D expenses	**$ 740,603**	$ 1,148,802	(36)%	**$ 2,317,973**	$ 2,535,987	(9) %

During the three months ended December 31, 2022, the Company incurred $0.7 million of R&D expenses, net of government grants, on internal projects in Q4 2022, a decrease of 36% compared to $1.1 million for the same period in the prior year.

The Company incurred $2.3 million of R&D expenses, net of government grants, on internal projects in 2022, a decrease of 9% compared to $2.5 million in 2021. The decrease in 2022 is due to a decrease in R&D activities, the type of contracts being executed, the nature of the project activity, and the decrease in government grants of $Nil compared to ($0.1 million) reported in 2021.

In addition to internally funded R&D projects, the Company also incurred R&D expenditures during the execution of client-funded projects. These expenses are eligible for Scientific Research and Experimental Development ("SR&ED") tax credits. SR&ED tax credits on client-funded projects are applied against cost of sales and services (see "Cost of Sales" above).

Financial Expenses

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
Interest on term loans	**160**	84,203	(100)%	**3,198**	87,775	(97) %
Interest on lease liabilities	**94,421**	86,177	10 %	**378,611**	307,691	23 %
Interest on balance due on business combination	**3,040**	110,203	(97)%	**173,350**	110,203	57 %
Interest accretion of royalty receivable	**(40,278)**	16,283	(347)%	**(118,290)**	(132,808)	(11) %
Interest accretion of term loan	**8,032**	3,219	250 %	**28,229**	12,185	232 %
Penalties and other interest	**(38,340)**	4,320	(802)%	**85,644**	19,324	489 %
Financial expenses	**$ 27,035**	$ 304,405	(91)%	**$ 550,742**	$ 404,370	36 %

During the three months ended December 31, 2022, financial expenses decreased to $0.03 million compared to $0.3 million for the same period in the prior year. The decrease is due to the various decreases in interest on term loans, penalties, and other interest expenses, not repeated in 2022.

Financial expenses for 2022 totaled $0.6 million as compared with $0.4 million for 2021, representing an increase of $0.1 million year-over-year. The increase in finance costs, is primarily attributable to the increase in accretion on the balance due on business combination and interest on the increased lease liability balance.

Strategic Investments

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
Changes to fair value of strategic investments	**$ (237,194)**	$ (11,045,508)	98 %	**$ (8,340,781)**	$ (21,426,218)	61 %

During the three months ended December 31, 2022, the adjustment to the fair market value of strategic investments resulted in a loss of $0.2 million compared to $11.0 million for the same period in the prior year. The 98% increase is primarily due to the closing share price of the HPQ common shares, used in determining the fair value.

The adjustment to the fair market value of strategic investments in 2022 resulted in a loss of $8.3 million compared to a loss in the amount of $21.4 million in 2021, representing a variation of $13.1 million. The variation is primarily attributable to closing share price of the HPQ common shares, used in determining the fair value of common shares and warrants owned by the Company of HPQ Silicon Inc.

Comprehensive loss

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
Comprehensive loss	**$ (10,818,755)**	$ (22,402,857)	(52)%	**$ (32,170,069)**	$ (38,428,495)	(16)%

The comprehensive loss for 2022 of $32.2 million compared to a loss of $38.4 million, in 2021, represents a decrease of 16% year-over-year. The variation of $6.3 million in the comprehensive loss in 2022 is primarily attributable to the factors described above, which have been summarized as follows, and includes the profit and loss items of Pyro Green-Gas since the acquisition date:

(i) a decrease in product and service-related revenue of $12.1 million arising in 2022,

(ii) a decrease in cost of sales and services of $7.8 million, primarily due to a decrease in direct materials, and investment tax credits,

(iii) an increase in SG&A expenses of $1.8 million arising in 2022 primarily due to an increase in professional fees, office & general, travel, depreciation of property and equipment, depreciation of ROU assets, government grants, other expenses, and the allowance for credit loss of $4.5 million,

(iv) a decrease in R&D expenses of $0.2 million primarily related to the decrease in government grants and an increase in investment tax credits,

(v) a decrease in share-based expenses of $4.2 million,

(vi) a decrease in changes in fair market value of strategic investments and net finance costs of $12.9 million,

(vii) a decrease in income taxes of $815,944.

In Q4 2022, the comprehensive loss is $11.6 million favorable, compared to Q4 2021, due to the reasons detailed above and summarized mainly as the reduction is revenue of $3.9 million, favorable impact of SG&A salaries and share-based expenses, offset by the allowance for credit loss of $4.48 million and an adjustment for change in fair value of strategic investment which is $10.8 million favorable versus Q4 2021.

Reconciliation of Non-IFRS measures (EBITDA, Adjusted and Modified)

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
Comprehensive loss	**$ (10,818,755)**	$ (22,402,857)	(52) %	**$ (32,170,069)**	$ (38,428,495)	(16) %
Depreciation of property and equipment	**157,011**	102,024	54 %	**603,894**	356,103	70 %
Depreciation of ROU assets	**156,362**	166,223	(6) %	**635,828**	570,411	11 %
Amortization of intangible assets	**218,760**	353,333	(38) %	**878,030**	465,913	88 %
Financial expenses	**183,694**	74,326	147 %	**550,742**	404,370	36 %
Income taxes	**—**	(739,960)	(100) %	**75,984**	(739,960)	110 %
EBITDA(1)	**$ (10,102,928)**	$ (22,446,911)	(55) %	**$ (29,425,591)**	$ (37,371,658)	(21) %
Other non-cash items:						
Share-based expenses	**1,316,221**	4,878,526	(73) %	**5,538,463**	9,762,745	(43) %
Change in fair value of investments	**237,194**	11,045,508	(98) %	**8,340,781**	21,426,218	(61) %
Modified EBITDA (1)	**$ (8,549,513)**	$ (6,522,877)	31 %	**$ (15,546,347)**	$ (6,182,695)	151 %

[1] See "Non-IFRS Measures"

The EBITDA in 2022 was a $29.4 million loss compared to an EBITDA loss of $37.4 million for 2021, representing n decrease of 21% year-over-year. The variation in the EBITDA in 2022 compared to 2021 is due to the decrease in comprehensive loss of $6.2 million, offset by an increase in depreciation on property and equipment of $0.2 million, an increase in depreciation on right-of-use assets of $0.07 million, an increase in amortization of intangible assets of $0.4 million, an increase in finance charges of $0.1 million and an increase in income taxes of $0.8 million. The 2022 Q4 EBITDA varied by $12.3 million mainly due to the reduced comprehensive loss in the quarter, and to the income tax reversal in Q4 2021, which was not repeated in 2022.

The Modified EBITDA in 2022 was a $15.5 million loss compared to a Modified EBITDA loss of $6.2 million for 2021, representing an increased loss of $9.3 million. The increase in the Modified EBITDA loss in 2022 is attributable to the decrease as mentioned above in the EBITDA of $7.9 million and a decrease in share-based expenses of $4.2 million from an expense not recurring in 2022 and a decrease in the change of fair value of investments of $13.1 million, based on the fair value of such investment. The 2022 Q4 Modified EBITDA is a loss of $8.55 million which is $2 million greater than Q4 2021, due to the quarterly EBITDA variation explained above, a decreased share-based expense in the current quarter and a fair value of the strategic investment which remained stable, based on the share price of the investment.

SUMMARY OF QUARTERLY RESULTS

	2022				2021			
	Q4	**Q3**	**Q2**	**Q1**	Q4	Q3	Q2	Q1
Revenues	**$ 3,301,777**	**$ 5,657,783**	**$ 5,847,180**	**$ 4,206,762**	$ 7,205,349	$ 9,317,926	$ 8,280,572	$ 6,264,503
Gross margin	**479,715**	**4,113,176**	**2,499,273**	**1,051,723**	1,302,789	4,052,531	4,933,481	2,143,010
Gross margin %	**14.5 %**	**72.7 %**	**42.7 %**	**25.0 %**	18.1 %	43.5 %	59.6 %	34.2 %
Comprehensive income (loss)	**(10,818,755)**	**(4,053,706)**	**(13,039,531)**	**(4,069,119)**	(22,402,857)	623,664	(20,362,205)	3,712,903
Earnings (loss) per share								
Basic	**(0.06)**	**(0.02)**	**(0.08)**	**(0.02)**	(0.13)	—	(0.12)	0.02
Diluted	**(0.06)**	**(0.02)**	**(0.08)**	**(0.02)**	(0.13)	—	(0.12)	0.02

The majority of PyroGenesis' revenue is recognised over the time of the contract and is dependent on the timing of project initiation and execution, including project engineering, manufacturing, and testing. Revenues in 2022 include revenues from the sale of intellectual property and royalties of $3.6 million ($3.3 million in 2021) and $280,842.14 ($315,846 in 2021), respectively.

LIQUIDITY AND CAPITAL RESOURCES

As at December 31, 2022, the Company had cash of $3.4 million, included in the net working capital of $1.7 million. Certain working capital items such as *Billings in excess of costs and profits on uncompleted contracts* do not represent a direct outflow of cash. The Company expects that with its cash, liquidity position, the proceeds available from the strategic investment and access to capital markets it will be able to finance its operations for the foreseeable future.

The Company's term loan balance at December 31, 2022 was $389,987, and the increase since January 1, 2022, was mainly attributable to the additional proceeds received on the Economic Development Agency of Canada loan. This loan is interest free and will remain so, until the balance is paid over the 60 month period ending March 2029. The average interest expense on the other term loans was 7.2% in 2022 and in 2021. The Company does not expect changes to the structure of term loans in the next fiscal year. The Company maintained two credit facilities which bear interest at variable rates of 7.45% and 8% at December 31, 2022. The Company expects to reimburse a portion of the credit facilities during 2023, and extending the due date of the remaining balance, while maintaining the similar conditions.

	Carrying Value	Total contractual amount	Less than 1 year	2-3 years	4-5 years	Over 5 years
	$	$	$	$	$	$
Bank indebtedness	991,902	991,902	991,902	—	—	—
Accounts payable and accrued liabilities[1]	9,620,591	9,620,591	9,620,591	—	—	—
Term loans	389,987	520,444	59,917	190,587	180,000	89,940
Balance due on business combination	3,907,775	4,137,820	2,177,800	1,960,020	—	—
Lease liabilities	5,533,694	6,745,329	2,984,243	1,165,281	703,816	1,891,989
	20,443,949	**22,016,086**	**15,834,453**	**3,315,888**	**883,816**	**1,981,929**

[1] Accounts payable and accrued liabilities exclude amounts which are not financial liabilities.

SUMMARY OF CASH FLOWS

	Three months ended Dec 31		Twelve months ended Dec 31	
	2022	2021	**2022**	2021
Cash used in operating activities	**$ (1,226,224)**	$ (1,763,488)	**$ (11,128,885)**	$ (18,113,432)
Cash provided by (used in) investing activities	**(111,458)**	1,299,358	**(368,180)**	2,722,957
Cash provided by (used in) financing activities	**2,346,316**	(3,128,952)	**2,641,007**	9,474,022
Effect of exchange rate changes on cash denominated in foreign currency	**72,154**	14,067	**99,194**	14,067
Increase (decrease) in cash	**1,080,788**	(3,579,015)	**(8,756,864)**	(5,902,386)
Cash - end of period	**3,445,649**	12,202,513	**3,445,649**	12,202,513

On a year-to-date basis, cash flow used by operating activities was $11.1 million compared to $18.1 million for the same period in the prior year. During the three months ended December 31, 2022, cash flow used by operating activities was $1.2 million compared to $1.8 million for the same period in the prior year. The use of cash during 2022 consists of the net loss of $32.2 million (2021 – net loss of $38.4 million) plus adjustments for operating activities of $16.6 million (2021 - $32.9 million), including a net change in non-cash operating working capital items of $4.2 million (2021 – net change of $12.6 million). During the three months ended December 31, 2022, the use of cash consisted of net losses of $10.7 million (Q4, 2021 – net loss of $22.4 million) plus adjustments for operating activities of $1.9 million (Q4, 2021 - $15.9 million), including a net change in non-cash operating working capital items of $7.8 million (Q4, 2021 – net change of $4.3 million).

Investing activities resulted in a use of funds of $0.4 million in 2022, compared to a net source of funds of $2.7 million in 2021 resulting from the additions to property and equipment, intangible assets, purchased and disposals of strategic investments and cash acquired through the business combination. During the three months ended December 31, 2022, investing activities resulted in a use of cash of $0.1 million, compared to a net source of funds of $1.3 million for the same period in the prior year. For Q4 2022 and fiscal 2022, the variation was mainly due to less purchases of property and equipment as equipment under construction was complete, and also from the variation of purchases and disposals of shares of the strategic investment.

Financing activities in 2022 resulted in a net source of funds of $2.6 million, compared with a net source of funds of $9.5 million for the same period in 2021. In 2022, the Company issued common shares for net cash proceeds of $2.7 million and repaid an amount of $0.7 million in loans and lease liabilities. In 2021, the Company issued common shares for net cash proceeds of $14.2 million, repaid an amount of $0.3 million in loans and lease liabilities and repurchased 0.8 million common shares for an amount of $4.2 million. Financing activities also include interest paid of $0.5 million in 2022 compared to $0.3 million in 2021. In fiscal 2022, the proceeds from the credit facilities represent a cash inflow of $1 million. During the three months ended December 31, 2022, financing activities resulted in a net source of funds of $2.3 million due partly to the private placement, compared with a use of funds of $3.1 million for the same period in the prior year.

The net cash position of the Company decreased by $8.8 million for 2022 compared to an increase of $5.9 million for 2021.

USE OF PROCEEDS FROM FINANCINGS

Description of intended use of funds from financings in the past 12 months	**Proposed use of proceeds from financings completed in the past 12 months**	**Use of funds to Date**
October 19, 2022: Private Placement for total gross proceeds of $1,318,980	Proceeds were intended and used for working capital and general corporate purposes	$ 1,318,980

CAPITAL STOCK INFORMATION

The authorized share capital of the Company consists of an unlimited number of common shares. As at March 30, 2023 PyroGenesis had 178,580,395 Common Shares, 6,014,600 share purchase warrants, 9,815,000 outstanding stock options issued, and 6,473,000 exercisable options issued.

GOING CONCERN

These consolidated financial statements have been prepared on the going concern basis, which presumes that the Company will be able to continue its operations for the foreseeable and will be able to realize its assets and discharge its liabilities in the normal course of business for the foreseeable future.

The Company is subject to certain risks and uncertainty associated with the achievement of profitable operations such as the successful signing and delivery of contracts and access to adequate financing.

The Company has incurred, in the last years, operating losses and negative cash flows from operations, and as a result, the Company has an accumulated deficit of $93,384,858 as at December 31, 2022 ($61,217,831 as at December 31, 2021). Furthermore, there have been unexpected delays in the collection of certain accounts receivable from contracts closed in a prior year. This has resulted in a shortfall in cash flows from operating activities that would be used in funding the Company's operations.

As at December 31, 2022, the Company has working capital of $1,650,709 ($14,006,785 as at December 31, 2021) including cash and cash equivalents of $3,445,649 ($12,202,513 as at December 31, 2021). The working capital is net of an allowance for credit losses amounting to $5,023,283 ($520,000 as at December 31, 2021) as further described in notes 9 and 10. The Company's business plan is dependent upon the successful completion of contracts and also the receipt of payments from certain contracts closed in a prior year and expects these payments to be made during fiscal 2023, as well as the achievement of profitable operations through the signing, completion and delivery of additional contracts or a reduction in certain operating expenses. In the absence of this, the Company is dependent upon raising additional funds to finance operations within and beyond the next twelve months. The Company has been successful in securing financing in the past and has relied upon external financing to fund its operations, primarily through the issuance of equity, debt and convertible debentures. The Company completed a private placement in October 2022 for an amount of $1,318,980 and also completed another private placement in March 2023 for $5,000,000 (see note 33). While the Company has been successful in securing financing, raising additional funds is dependent on a number of factors, some of which are outside the Company's control, and therefore there is no assurance that it will be able to do so in the future or that these sources will be available to the Company or that they will be available on terms which are acceptable to the Company. These conditions indicate the existence of a material uncertainty that may cast significant doubt about the Company's ability to continue operating as a going concern.

The consolidated financial statements have been prepared on a going concern basis and do not include any adjustments to the amounts and to classifications of the assets and liabilities that might be necessary should the Company be unable to achieve its plan and continue in business. If the going concern assumption were not appropriate, adjustments, which could be material, would be necessary to the carrying value of assets and liabilities, the reported expenses, and the classification of items on the consolidated statement of financial position.

RELATED PARTY TRANSACTIONS

During the year ended December 31, 2022 and 2021, the Company concluded the following transactions with related parties:

In 2022, rent and property taxes were charged by a trust whose beneficiary is the controlling shareholder and CEO of the Company in the amount of $277,389 (2021 - $274,934). On January 1, 2022, a lease for rent of a property with a trust whose beneficiary is the controlling shareholder and CEO of the Company, was modified to extend the lease term until December 2026. The lessor also reimbursed an amount of $1,070,264 representing the balance at the date of modification of the original prepayment amount of $1,178,530 made in 2020. At the date of modification, the lease liability was remeasured using a discount rate of 4%. As a result, the lease liability was increased by an amount of $1,070,264 and the right-of-use assets was decreased by an amount of $108,267.

These expenses are recorded in captions cost of sales and selling and general in the consolidated statements of comprehensive loss. As at December 31, 2022 the right-of-use asset and the lease liabilities amount to $680,980 and $799,090 respectively (2021 - $1,107,131 and $Nil).

A balance due to the controlling shareholder and CEO of the Company amounted to $254,097 (2021 - $144,506) is included in accounts payable and accrued liabilities.

The key management personnel of the Company, in accordance with IAS 24 Related Party Disclosures, are the members of the Board of Directors and certain officers. Total compensation to key management consisted of the following:

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2022	2021	**2022vs2021**	**2022**	2021	**2022vs2021**
Salaries - key management	**$ 359,932**	$ 2,335,482	(85)%	**$ 1,204,306**	$ 3,049,501	(61) %
Pension contributions	**6,838**	46,335	(85)%	**22,479**	59,377	(62) %
Fees - Board of Directors	**23,200**	40,200	(42)%	**157,900**	187,600	(16) %
Share-based compensation - officers	**245,915**	4,125,512	(94)%	**2,017,348**	6,182,573	(67) %
Share-based compensation - Board of Directors	**313,757**	375,333	(16)%	**2,293,167**	2,338,650	(2) %
Other benefits - key management	**222,686**	61,684	261 %	**244,621**	237,903	3 %
Total compensation	**$ 1,172,328**	$ 6,984,546	(83)%	**$ 5,939,821**	$ 12,055,604	(51) %

CORPORATE HIGHLIGHTS

On February 2, 2022, PyroGenesis announced the receipt of a US$3,000,000 purchase order for the first of three 10-tonne DROSRITE systems from an existing client.

On February 7, 2022, PyroGenesis announced that it had signed an agreement with a European research center for the sale of a plasma torch system which will be used to develop a process to convert hydrocarbons, including GHG producing gases such as methane, into non-hazardous chemicals.

On April 25, 2022, Pyrogenesis confirmed that the Company's DROSRITE dross recovery technology (a total of seven DROSRITE systems) has been successfully commissioned for Ma'aden Aluminum.

On May 19, 2022, PyroGenesis announced that it had completed a commercial order for titanium powders. The order derived from the Company's partnership agreement with Aubert & Duval, a multinational specializing in upscale metallurgy, and the powder in question was produced at PyroGenesis' production facility using its NexGen plasma atomization system.

On September 7, 2022, the Company announced that it has been selected by an international producer of magnesium metal, to test PyroGenesis' zero-emission plasma torches as part of their process for transforming mining waste and recycled minerals into high-value metal.

On October 6, 2022, PyroGenesis confirmed that its Gen3 PUREVAP Quartz Reduction Reactor pilot plant had completed the month-long power-up process and was initiating the testing phase of its transformation of quartz into high purity silicon. The plant is designed to produce multiple systems that can operate under harsh conditions, including at extremely high temperatures and under vacuum.

On October 19, 2022, PyroGenesis announced that it has completed a non-brokered private placement consisting of the issuance and sale of 1,014,600 units of the Corporation at a price of $1.30 per unit, for gross proceeds of $1,318,980 to the Company. Each unit consisted of one Common Share and one warrant entitling the holder thereof to purchase one Common Share at a price of $1.75 until October 19, 2024.

On November 2, 2022, PyroGenesis announced that it has passed its annual quality audit for two key international standards: ISO 9001:2015, and AS9100D. The audits encompassed all of PyroGenesis' facilities for the purpose of meeting compliance with the existing quality management designations.

On November 10, 2022, PyroGenesis announced that it has successfully produced hydrogen from methane using zero-carbon emission hydrogen production technology.

SUBSEQUENT EVENTS

On March 8, 2023, the Company announced it had completed a non-brokered private placement consisting of the issuance and sale of 5,000,000 units of the Company at a price of $1.00 per unit, for gross proceeds of $5,000,000. Each unit consists of one common share of the Company and one common share purchase warrant. Each warrant entitles the holder thereof to purchase one common share at a price of $1.25 until March 7, 2025. The entire amount is allocated to the common shares as the fair value of the common shares on March 8, 2023, was $1.38.

CRITICAL ACCOUNTING ESTIMATES, NEW AND FUTURE ACCOUNTING POLICIES AND FINANCIAL INSTRUMENTS

For a discussion of significant accounting policies, judgements, estimates assumptions and financial instruments, please refer to notes 4, 5 and 28 of the 2022 consolidated financial statements.

CONTROLS AND PROCEDURES

The Company's shares are traded on the Toronto Stock Exchange ("TSX") since November 2020 and on the NASDAQ since March 2021. Prior to November 2020, the Company's shares traded on the TSX Venture Exchange ("TSXV"), and all requirements of the TSXV were attainted by the Company. The Company acknowledged that being listed on the TSX, and NASDAQ would require more stringent disclosure controls, and started implementing such before the NASDAQ listing.

As a result of the graduation to the TSX and NASDAQ, the Company became subject to additional requirements under applicable securities laws relating to the establishment and maintenance of disclosure controls and procedures ("DC&P") and internal control over financial reporting ("ICFR"), as defined in NI 52-109 and the applicable rules of the U.S. Securities and Exchange Commission. Such requirements also include the assessment and evaluation of both DC&P and ICFR, which was not required while the Company was listed on the TSXV. Consequently, the Company continues to take several actions to improve its DC&P and ICFR, in accordance with the thresholds provided by the regulators. The Company is currently implementing measures designed to improve its ICFR environment and remediate the control deficiencies that led to the material weaknesses identified below.

In accordance with the provisions of National Instrument 52-109 – Issuers' annual and interim filings ("NI 52-109") adopted by Canadian securities regulators and in Rule 13a-15(e) and 15d-15(e) under the U.S. Securities Exchange Act of 1934, as amended (the "Exchange Act"), the Company has filed certificates signed by the Chief Executive Officer ("CEO") and Chief Financial Officer ("CFO") that report on, among other items, i) their responsibility for establishing and maintaining DC&P and ICFR for the Company, ii) the design of DC&P and the design of ICFR, and the effectiveness of DC&P and ICFR.

Disclosure controls and procedures

The Company under the supervision of the CEO and CFO, have designed DC&P (as defined in NI-52-109 and Rule 13a-15(e) and 15d-15(e) under the Exchange Act), in order to provide reasonable assurance that:

- material information relating to the Company is made known to the CEO and CFO by others; and
- information required to be disclosed by the Company in its filings, under applicable securities legislation is recorded, processed, summarized and reported within the time periods specified in securities legislation.

As of December 31, 2022, an evaluation was carried out under the supervision of the CEO and CFO, of the design and operating effectiveness of the Company's DC&P. Based on this evaluation, the CEO and CFO concluded that due to the material weaknesses in our ICFR as described below in Management's Annual Report on Internal Controls over Financial Reporting, the Company's DC&P were not effective as of December 31, 2022.

Management's Annual Report on Internal Controls over Financial Reporting

The Company under the supervision of the CEO and CFO, are responsible to design ICFR (as defined in NI-52-109 and Rules 13a-15(f) and 15d-15(f) under the Exchange Act) in order to provide reasonable assurance regarding the reliability of financial reporting and the preparation of consolidated financial statements for external purposes in accordance with IFRS as issued by the IASB.

As of December 31, 2022, an evaluation was carried out, under the supervision of the CEO and the CFO, of the effectiveness of the Company's ICFR. Based on this evaluation, the CEO and the CFO concluded that material weaknesses exist, as described below, and due to these material weaknesses, the Company's ICFR is not effective as of December 31, 2022. The control framework used to design and evaluate effectiveness of the Company's ICFR is established under the criteria set forth by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) on Internal Control – Integrated Framework (2013 framework). A material weakness is a deficiency, or combination of deficiencies, in ICFR, such that there is a reasonable possibility that a material misstatement of the Company's annual or interim consolidated financial statements will not be prevented or detected on a timely basis.

In connection with the Company's evaluation of ICFR, the following are the control deficiencies that were considered to be material weaknesses in the current year, and in 2021 and any remediation that occurred during fiscal 2022:

- **Control environment:** The Company did not maintain an effective control environment and has identified deficiencies relating to appropriate organizational structure and authority and responsibilities. The Company did not have a sufficient number of trained resources with the appropriate skills and knowledge with assigned responsibilities and accountability for the design and operation of ICFR and for holding individuals accountable for their internal control-related responsibilities.

  Nonetheless, during a portion of 2022, the deficiencies related to the control environment over reporting lines as well as authority and responsibilities were improved with the implementation of additional controls. Oversight and governance of financial reporting and related party transactions, including the oversight executed by Board of Directors and the Audit Committee was not indicative of a control environment deficiency. The Company has financial reporting resources internally, or at their disposal to ensure they can deal with complex accounting matters, as well as period-end controls to mitigate the risk of misstatement in the financial information.

- **Control activities:** The Company did not fully design and implement effective control activities and has identified deficiencies relating to: (i) selecting and developing control activities that contribute to the mitigation of risks to acceptable levels, and (ii) deploying control activities through policies that establish what is expected and procedures that put policies into action.

  During 2022, the Company continued to implement numerous internal controls, including compensating controls to mitigate these risks as well as adding sufficient levels of review and approval in order to reduce the risk related to control activities thereby improving the quality of financial information.

- **Journal Entries:** The Company did not effectively design and maintain appropriate segregation of duties and controls over the effective preparation, review and approval, and associated documentation of journal entries, across its ERP platform. The Company did not have adequate review procedures for the recording of manual entries.

  Throughout 2022 however, the Company continues to modify their processes to ensure that journal entries are sufficiently reviewed and approved, and compensating controls exist to ensure the financial information is free of misstatement.

- **Complex Spreadsheet Controls:** The Company did not implement and maintain effective controls surrounding certain complex spreadsheets, including addressing all identified risks associated with manual data entry, completeness of data entry, and the accuracy of mathematical formulas, impacting complex spreadsheets used in fixed asset continuity schedules, production and revenue forecasting, and the calculation of the fair value of investments.

  During the course of 2022, the Company continued to improve the safeguarding of spreadsheets and data, through various controls, password protections and improved segregation of duties with the objective of reducing the possibility of error.

- **User Access Controls:** The Company did not maintain effective user access controls to adequately restrict user access to financial applications and related data in accordance with job responsibilities, for the entirety of 2022.

  In response to this, the Company has continued to implement controls to limit the access to financial and non-financial applications, based on employee profile. The Company continues to implement IT environment best practices for access controls, including prompt changes, access limitation to appropriate users and systematic periodic reviews of account privileges. Automated access controls are being integrated into the new ERP system.

As a consequence, the Company did not have effective control activities related to the design, implementation and operation of process-level and management review control activities related to order-to-cash (including revenue trade receivables, and billings in excess of cost/cost in excess of billings), procure-to-pay (including operating expenses, prepaid expenses, accounts payable, and accrued liabilities), hire-to-pay (including compensation expense and accrued liabilities), long-lived assets, significant unusual transactions, related party transactions and other financial reporting processes for the entire year.

Aside from these material weaknesses, management has concluded that the Company's consolidated financial statements as at and for the year ended December 31, 2022, present fairly, in all material respects, the Company's financial position, results of operations, changes in shareholders' equity and cash flows in accordance with IFRS as issued by the IASB. There were no material adjustments to the Company's consolidated financial statements for the year ended December 31, 2022, and there were no changes to previously released financial results. However, because the deficiencies and material weaknesses create a reasonable possibility that a material misstatement to our consolidated financial statements would not be prevented or detected on a timely basis, the CEO and CFO concluded that as of December 31, 2022, the Company's design and operation of ICFR and DC&P were not effective.

Management's Ongoing Remediation Measures

During the year ended December 31, 2022, and beyond, management initiated and continues to implement remediation measures as outlined above, in the 2021 annual MD&A as well as the quarterly MD&A's of 2022. Management has performed an initial risk assessment using a top-down, risk-based approach with respect to the risks of material misstatement of the consolidated financial statements. In addition, compensating controls have been applied to the areas where the risks of material misstatement are considered moderate to high, as throughout the various accounting cycles. The Company is using and plans to continue to use outside resources to strengthen the business process documentation and help with management's self-assessment and testing of internal controls. In 2023, the Company's management, with oversight of the Audit Committee expects to advance the documenting, testing, and refining the internal controls, in addition with the upgrade to the ERP system, which inherently will add additional automated controls. As a result, the Company will improve the design of control activities and strengthen process controls surrounding sales, purchases, payroll, among others, and will be call for fewer compensating controls.

Although the Company can give no assurance that these actions will remediate these material weaknesses in internal controls or that additional material weaknesses in our ICFR will not be identified in the future, management believes the foregoing efforts will, when implemented, strengthen our ICFR and DC&P and effectively remediate the identified material weaknesses.

Management will take additional remedial actions as necessary as they continue to evaluate and work to improve the Company's ICFR environment.

Changes in internal controls over financial reporting

Other than the material weaknesses described above, and the remediation process described above, there were no changes to the Company's ICFR during the year ended December 31, 2022 that have materially affected, or are reasonably likely to materially affect, the Company's ICFR.

Limitations on Effectiveness of Disclosure Controls and Procedures and Internal Control over Financial Reporting

The Company's management recognizes that any DC&P and ICFR, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives. Because of their inherent limitations, DC&P and ICFR may not prevent or detect all errors or misstatements on a timely basis.

RISK FACTORS

The Company has identified below certain significant risks relating to the business of the Company and the industry in which it operates. The following information is only a summary of certain risk factors and is qualified in its entirety by reference to, and must be read in conjunction with, the detailed information appearing elsewhere in this MD&A. These risks and uncertainties are not the only ones facing the Company. Additional risks and uncertainties not currently known to the Company, or that the Company currently considers immaterial, may also impair the operations of the Company. If any such risks materialize into actual events or circumstances, the Company's assets, liabilities, financial condition, results of operations (including future results of operations), business and business prospects, are likely to be materially and adversely affected. There is no assurance that risk management steps taken will avoid future loss due to the uncertainties described below or other unforeseen risks. An investment in the Common Shares or other securities of the Company is highly speculative and involves a high degree of risk. Before making any investment decision, prospective investors should carefully consider all the information contained in this document including, in particular, the risk factors described below.

Certain factors may have a material adverse effect on the Company's business, financial condition and results of operations. Current and prospective investors should carefully consider the risks and uncertainties and other information contained in this MD&A, the 2022 consolidated Financial Statements and the Annual Information Form, particularly under the heading "Risk Factors" in the Annual Information Form, and in other filings that the Company has made and may make in the future with applicable securities authorities, Company's website at www.pyrogenesis.com. The risks and uncertainties described herein and therein are not the only ones the Company may face. Additional risks and uncertainties that the Company is unaware of, or that the Company currently believes are not material, may also become important factors that could adversely affect the Company's business. If any of such risks actually occur, the Company's business, financial condition, results of operations, and future prospects could be materially and adversely affected. In that event, the trading price of the Common Shares (or the value of any other securities of the Company) could decline, and the Company's securityholders could lose part or all of their investment.

Risks Related to the Company's Business and Industry

Operating Income (Loss) and Negative Operating Cash Flow

Prior to December 31, 2022, the Company had a history of losses and negative cash flows. For the year ended December 31, 2022, the Company has net losses of $32.2 million, cash flows used in operations of $11.1 million, and an accumulated deficit of $93.4 million at December 31, 2022. To the extent that the Company has net losses and negative operating cash flow in future periods, it may need to allocate a portion of its cash reserves to fund such negative cash flow. The Company may also be required to raise additional funds through the issuance of equity or debt securities. There can be no assurance that the Company will be able to generate a positive cash flow from its operations, that additional capital or other types of financing will be available when needed or that these financings will be on terms favourable to the Company.

The Company's ability to continue as a going concern is dependent upon its ability in the future to grow its revenue, achieve profitable operations, successfully developing and introducing new products and, in the meantime, to obtain the necessary financing to meet its obligations and repay its liabilities when they become due. While the Company has been successful in securing financing in the past, raising additional funds is dependent on a number of factors outside the Company's control, and as such there is no assurance that it will be able to do so in the future. External financing, predominantly by the issuance of equity and debt, might be, sought to finance the operations of the Company; however, there can be no certainty that such funds will be available at terms acceptable to the Company, or at all. If the Company is unable to obtain sufficient additional financing, it may have to curtail operations and development activities, any of which could harm the business, financial condition and results of operations.

Actual Financial Position and Results of Operations May Differ Materially from the Expectations of the Company's Management

The Company's actual financial position and results of operations may differ materially from management's expectations. The Company has experienced some changes in its operating plans and certain delays in the timing of its plans. As a result, the Company's revenue, net income and cash flow may differ materially from the Company's projected revenue, net income and cash flow. The process for estimating the Company's revenue, net income and cash flow requires the use of judgment in determining the appropriate assumptions and estimates. These estimates and assumptions may be revised as additional information becomes available and as additional analyses are performed. In addition, the assumptions used in planning may not prove to be accurate, and other factors may affect the Company's financial condition or results of operations.

Revenue Risks

PyroGenesis may experience delays in achieving revenues, particularly with plasma gasification projects which have a long sales cycle. Revenues may be delayed or negatively impacted by issues encountered by the Company or its clients including:

(i) unforeseen engineering and/or environmental problems;

(ii) delays or inability to obtain required financing, licenses, permits and/or regulatory approvals;

(iii) supply interruptions and/or labour disputes;

(iv) foreign exchange fluctuations and/or collection risk; and

(v) competition from other suppliers and/or alternative energy solutions that are less capital intensive.

There is no assurance that the business will perform as expected or that returns from the business will support the expenditures needed to develop it.

Concentration Risk and Credit Risk

To date, a small number of customers have accounted for a majority of PyroGenesis' revenues. As its business expands, the Company expects that revenue distribution will be over a larger number of different customers. For the year ended December 31, 2022, sales of PyroGenesis to its two principal customers accounted for approximately 52% of its total revenue. For the year ended December 31, 2021, sales to two principal customers accounted for approximately 79% of PyroGenesis' total revenue. The loss of, or a reduction in, purchase orders or anticipated purchase orders from PyroGenesis' principal customers could have a material adverse effect on its business, financial condition and results of operations. Additionally, if one of PyroGenesis' customers is unable to meet its commitments to PyroGenesis, the Company's business, financial condition and results of operations could be adversely affected.

As a result of the Drosrite International Exclusive Agreement and the Dross Processing Service Agreement, the Company generates significant revenues from payments made to Drosrite International under the Dross Processing Service Agreement. The Company will no longer receive payments under such arrangement if the Dross Processing Service Agreement, which involves a third party in a foreign jurisdiction, is terminated, which could have a material adverse effect on the business, financial condition and results of operations of the Company.

Credit risk is the risk that one party to a financial instrument will cause a financial loss for the other party by failing to discharge an obligation. The maximum credit risk to which the Company is exposed as at December 31, 2022 represents the carrying amount of cash and cash equivalents, accounts receivable (except sales tax receivable), costs and profits in excess of billings on uncompleted contracts, deposits and royalties receivable.

Cash and cash equivalents, which only comprise guaranteed investment certificates redeemable on relatively short notice by the Company, are held with major reputable financial institutions.

Management has established a credit policy under which each new customer is analysed individually for creditworthiness before the Company's payment and delivery terms and conditions are offered. The Company's review could include reviewing external ratings, if they are available, financial statements, credit agency information, industry information and in some cases bank references. The Company's exposure to credit risk is mainly influenced by the individual characteristics of each customer. In monitoring customer credit risk, customers are identified according to their characteristics such as their geographic location, industry, trading history with the Company and existence of previous financial difficulties.

The Company does not generally require collateral or other security from customers on accounts receivable, however, the contract terms may include the possibility of recourse in the event of late payment. The Company believes that there is no unusual exposure associated with the collection of these receivables.

The credit risk associated with costs and profits in excess of billings on uncompleted contracts is similar to that of accounts receivable, as these amounts are accumulated and converted to accounts receivable as invoicing milestones are reached.

The royalties receivable are due from a company in which the Company has a strategic investments. The Company does not have collateral or other security associated with the collection of this receivable. The carrying amount of the royalties receivable have been discounted to reflect the time value of money and credit risk of the counterparty.

The deposits are payments made to suppliers and entities from which the Company leases property. The Company does not have collateral or other security associated with the collection of these deposits. As at December 31, 2022 and 2021, no loss allowance has been recognized in connection with these deposits and the maximum exposure is the carrying amount of these deposits.

During the years 2022 and 2021, provisions for expected credit losses were recorded, however, no amounts of financial assets have been written off. The accounts provisioned by the loss are still subject to enforcement activity in order to collect the balances due.

Technology Development and Manufacturing Capability Risks

PyroGenesis recently expanded into new areas of business and, as a result, many of the Company's products are at various stages of the development cycle. The Company may be unable to commercialise such products, or it may be unable to manufacture such products in a commercially viable manner. Whilst management is confident in both its technology and in its team of experienced engineers, scientists and technicians, it cannot know with certainty, which of its products will be commercialised, when such products will be commercialised, or whether such products will be able to be manufactured and distributed profitably.

Product Revenues/History of Losses

PyroGenesis has incurred losses in the majority of years since its inception. In the past the Company's operations have not generated sufficient earnings and cash flows to date to result in consistent profitability or positive cash flow. For the year ended December 31, 2022, the Company has a net loss of $32.2 million which includes a loss from the change in value of strategic investment of $8.3 million and cash flows used in operations of $11.1 million. There can be no assurance that the Company will be able to continue to generate significant gains from the value of its strategic investments in the future.

Additional financing and dilution

PyroGenesis may require additional financing. There can be no assurance that additional financing will be available to the Company when needed, or on terms acceptable to the Company.

PyroGenesis' inability to raise financing to support ongoing operations or to fund capital expenditures could limit the Company's growth and may have a material adverse effect upon the Company.

The Company does not exclude raising additional funds by equity financing. In addition, at March 30, 2023, 9,815,500 stock options are currently issued and outstanding, together with 6,014,600 share purchase warrants. The exercise of stock options and/or warrants, as well as any new equity financings, represents dilution factors for present and future shareholders.

Reliance on Third Party Suppliers, Service Providers, Distributors and Manufacturers

The Company's direct and indirect suppliers, service providers, distributors and manufacturers may elect, at any time, to breach or otherwise cease to participate in supply, service, distribution or manufacturing agreements, or other relationships, on which the Company's operations rely. Loss of its suppliers, service providers, distributors and manufacturers could have a material adverse effect on the Company's business and operational results. Further, any disruption in the manufacturing process done by third-party manufacturers could have a material adverse effect on the business, financial condition and results of operations of the Company. The Company cannot ensure that alternative production capacity would be available in the event of a disruption, or if it would be available, it could be obtained on favorable terms.

Manufacturing Facilities

The vast majority of the Company's products are manufactured in its manufacturing facilities located in Montreal, Quebec, as well as in Italy and India. Accordingly, the Company is highly dependent on the uninterrupted and efficient operation of its manufacturing facilities. If for any reason the Company is required to discontinue production at its facilities, it could result in significant delays in production of the Company's products and interruption of the Company's sales as it seeks to resume production. The Company may be unable to resume production on a timely basis. If operations at the facilities were to be disrupted as a result of equipment failures, natural disasters, fires, accidents, work stoppages, power outages or other reasons, the Company's business, financial condition and/or results of operations could be materially adversely affected.

Sales Cycle and Fixed Price Contracts

PyroGenesis sales cycle is long and the signing of new contracts is subject to delay, over which the Company has little control. The Company also enters into sales contracts with fixed pricing, which may be impacted by changes over the period of implementation. There is no assurance that delays or problems in fulfilling contracts with clients will not adversely affect the Company's activities, operating results or financial position.

Reliance on Technology

PyroGenesis will depend upon continuous improvements in technology to meet client demands in respect of performance and cost, and to explore additional business opportunities. There can be no assurance that the Company will be successful in its efforts in this regard or that it will have the resources available to meet this demand. Whilst management anticipates that the research and development will allow the Company to explore additional business opportunities, there is no guarantee that such business opportunities will be presented or realized. The commercial advantage of the Company will depend to a significant extent on the intellectual property and proprietary technology of PyroGenesis and the ability of the Company to prevent others from copying such proprietary technologies. PyroGenesis currently relies on intellectual property rights and other contractual or proprietary rights, including (without limitation) copyright, trade secrets, confidential procedures, contractual provisions, licenses and patents, to protect its proprietary technology. PyroGenesis may have to engage in litigation in order to protect its patents or other intellectual property rights, or to determine the validity or scope of the proprietary rights of others. This type of litigation can be expensive and time consuming, regardless of whether or not the Company is successful. PyroGenesis may seek patents or other similar protections in respect of particular technology; however, there can be no assurance that any future patent applications will actually result in issued patents, or that, even if patents are issued, they will be of sufficient scope or strength to provide meaningful protection or any commercial advantage to the Company.

Moreover, the process of seeking patent protection can itself be long and expensive. In the meantime, competitors may develop technologies that are similar or superior to PyroGenesis' technology or design around the patents owned by the Company, thereby adversely affecting the Company's competitive advantage in one or more of its areas of business. Despite the efforts of the Company, its intellectual property rights may be invalidated, circumvented, challenged, infringed or required to be licensed to others. It cannot be assured that any steps the Company may take to protect its intellectual property rights and other rights to such proprietary technologies that are central to the Company's operations will prevent misappropriation or infringement of its technology.

Changes to Contracts

PyroGenesis is dependent upon its ability to establish and develop new relationships and to build on existing relationships with current clients. The Company cannot provide assurance that it will be successful in maintaining or advancing its relationships with current clients or procure additional clients. In addition, PyroGenesis cannot provide assurance that its customers and the end users of its products will continue to provide the Company with business, or that existing customers and end users will not seek to renegotiate or terminate existing contracts providing for the sale of the Company's products and technology based on circumstances on which the Company is not currently aware. Any termination or amendment of a contract under which the Company derives an important portion of its revenues, including the Drosrite International Exclusive Agreement and the Dross Processing Service Agreement, and any adverse change in the relationship of the Company with its customers and end users, will have an adverse effect on the Company's business, financial condition and results of operations.

Sales to governments and governmental entities are subject to specific additional risks, such as delays in funding, termination of contracts or sub-contracts at the convenience of the government, termination, reduction or modification of contracts or sub-contracts in the event of changes in the government's policies or as a result of budgetary constraints and increased or unexpected costs resulting in losses or reduced profits under fixed price contracts.

Foreign Exchange Exposure

PyroGenesis' products and services are increasingly being sold in markets outside of Canada, whilst most of its operating expenses and capital expenditures are denominated in Canadian dollars. As a result, the Company is exposed to fluctuations in the foreign exchange rates between Canadian dollar and the currency in which a particular sale is transacted, which may result in foreign exchange losses that could affect earnings. Foreign sales are predominantly denominated in U.S. dollars, as well as the Euro and Indian Rupee. The Company has not to date sought to hedge the risks associated with fluctuations in foreign exchange rates.

Competition

The industry is competitive and PyroGenesis competes with a substantial number of companies which have greater technical and financial resources. There can be no assurance that such competitors will not substantially increase the resources devoted to the development and marketing of products and services that compete with those of the Company or that new or existing competitors will not enter the various markets in which PyroGenesis is active. There can be no assurance that competitors will not develop new and unknown technologies with which the Company may have difficulty competing. Furthermore, failure to remain cost competitive may result in PyroGenesis losing business to its competitors.

The plasma technology of PyroGenesis competes against other plasma and conventional technologies. Without limitation, the demand for the plasma technology of PyroGenesis, particularly in waste destruction and waste-to-energy systems, can be impacted by the commodity prices of the energy source used for the process and the price at which waste is accepted by landfills and traditional waste processing plants. While the Company believes that demand for sustainable waste management practices that have lower environmental impacts than traditional solutions such as landfill or incineration is increasing, the high flows of electricity necessary to operate the waste destruction and waste-to-energy systems of PyroGenesis have an impact on the operational costs of the Company's systems, and traditional solutions may constitute lower-cost solutions, particularly if commodity prices (including of oil and natural gas) remain low or experience a decline.

Management and Key Personnel

PyroGenesis depends on the skills and experience of its management team and other key employees. The Company relies heavily on its ability to attract and retain highly skilled personnel in a competitive environment. PyroGenesis may be unable to recruit, retain, and motivate highly skilled employees in order to assist the Company's business, especially activities that are essential to the success of the Company. Failure to recruit and retain highly skilled employees may adversely affect PyroGenesis' business, financial condition and results of operations.

Implementation of a strategic plan

PyroGenesis' commercial strategy aims to leverage its products, consumables, and services whilst focusing on the resolution of problems within niche markets within the industries served by the Company. There can be no assurances as to the success of the Company's strategic plan, which should be considered under the risks perspective and difficulties frequently encountered by a developing business.

Adverse Decisions of Sovereign Governments

PyroGenesis conducts an increasing portion of its business internationally. There is no assurance that any sovereign government, including Canada's, will not establish laws or regulations that will not be detrimental to the Company's interests or that, as a foreign corporation, it will continue to have access to the regulatory agencies in other countries. Governments have, from time to time, established foreign exchange controls, which could have a material adverse effect on the Company's business, financial condition and results of operations.

Risks Related to International Operations

A substantial portion of the Company's sales are made to customers and end users outside Canada. The Company conducts its international operations directly or through distributors or other agents or intermediaries, including Drosrite International. The Company plans to continue to expand its international sales and marketing efforts. International operations are subject to a number of inherent risks, and the Company's future results could be adversely affected by a number of factors, including:

- unfavorable political or economic environments; requirements or preferences for domestic products or solutions, which could reduce demand for the Company's products;
- differing existing or future regulatory and certification requirements;
- unexpected legal or regulatory changes;
- greater difficulty in collecting accounts receivable and longer collection periods;
- difficulties in enforcing contracts; an inability to effectively protect intellectual property;
- tariffs and trade barriers, export regulations and other regulatory and contractual limitations on the Company's ability to sell its products; and
- potentially adverse tax consequences, including multiple and possibly overlapping tax structures.

Fluctuations in currency exchange rates could materially adversely affect sales denominated in currencies other than the Canadian dollar and cause a reduction in revenues derived from sales in a particular country. Financial instability in foreign markets could also affect the sale of the Company's products in international jurisdictions. In addition, the Company may be denied access to its end customers as a result of a closing of the borders of the countries in which it its products are sold due to economic, legislative, political and military conditions in such countries.

There can be no assurance that such factors will not materially adversely affect the operations, growth prospects and sales of the Company and, consequently, its results of operations. In addition, revenues the Company earns in other jurisdictions may be subject to taxation by more than one jurisdiction, which could materially adversely affect the Company's earnings. Each of these factors could have an adverse effect on the Company's business, financial condition and results of operations.

Governmental Regulation

PyroGenesis is subject to a variety of federal, provincial, state, local and international laws and regulations relating namely to the environment, health and safety, export controls, currency exchange, labour and employment and taxation. These laws and regulations are complex, change frequently and have tended to become more stringent over time. Failure to comply with these laws and regulations may result in a variety of administrative, civil and criminal enforcement measures, including assessment of monetary penalties, imposition of remedial requirements and issuance of injunctions as to future compliance. The Company may be subject to compliance audits by regulatory authorities in the various countries in which it operates.

Government-funded Defense and Security Programs

Like most companies that supply products and services to governments, government agencies routinely audit and investigate government contractors. These agencies may review the Company's performance under its contracts, business processes, cost structure, and compliance with applicable laws, regulations and standards. The Company's incurred costs for each year are subject to audit by government agencies, which can result in payment demands related to costs they believe should be disallowed. The Company works with governments to assess the merits of claims and where appropriate reserve for amounts disputed. The Company could be required to provide repayments to governments and may have a negative effect on its results of operations.

Contrary to cost-reimbursable contracts, some costs may not be reimbursed or allowed under fixed-price contracts, which may have a negative effect on the Company's results of operations if it experiences costs overruns.

Environmental Liability

PyroGenesis is subject to various environmental laws and regulations enacted in the jurisdictions in which it operates, which govern the manufacturing, processing, importation, transportation, handling and disposal of certain materials used in the Company's operations. Management believes that it has adequate procedures in place to address compliance with current environmental laws and regulations. Furthermore, management monitors the Company's practices concerning the handling of environmentally hazardous materials. However, there can be no assurance that the

Company's procedures will prevent environmental damage occurring from spills of materials handled by the Company or that such damage has not already occurred. On occasion, substantial liabilities to third parties may be incurred. The Company may have the benefit of insurance maintained by it or the operator, however, the Company may become liable for damages against which it cannot adequately insure or against which it may elect not to insure because of high costs or other reasons. The Company's clients are subject to similar environmental laws and regulations, as well as limits on emissions to the air and discharges into surface and sub-surface waters. While regulatory developments that may follow in subsequent years could have the effect of reducing industry activity, the Company cannot predict the nature of the restrictions that may be imposed. The Company may be required to increase operating expenses or capital expenditures in order to comply with any new restrictions or regulations.

Product Liability and Other Lawsuits

PyroGenesis is subject to a variety of potential product liabilities claims and other lawsuits related with its operations, including liabilities and expenses associated with product defects. The Company maintains product liability and other insurance coverage that management believes is generally in accordance with the market practice in its industry, but there can be no assurance that the Company will always be adequately insured against all such potential liabilities.

A malfunction or the inadequate design of the Company's products could result in product liability or other tort claims. Accidents involving the Company's products could lead to personal injury or physical damage. Any liability for damages resulting from malfunctions could be substantial and could materially adversely affect the Company's business and results of operations. In addition, a well-publicized actual or perceived problem could adversely affect the market's perception of the Company's products. This could result in a decline in demand for the Company's products, which would materially adversely affect the Company's financial condition and results of operations.

The sale and use of products and processes developed by the Company may entail potential liability and possible warranty claims. The Company may be subject to personal injury claims for injuries resulting from use of its products. Although the Company maintains product liability insurance, there can be no assurance that such insurance will continue to be available on commercially reasonable terms or that the risks covered, or coverage amounts will be sufficient to cover all claims.

Information systems disruptions

The Company relies on various information technology systems to manage its operations. Over the last several years, the Company has implemented, and it continues to implement, modifications and upgrades to such systems, including changes to legacy systems, replacing legacy systems with successor systems with new functionality, and acquiring new systems with new functionality. These types of activities subject the Company to inherent costs and risks associated with replacing and changing these systems, including impairment of the Company's ability to fulfill customer orders, potential disruption of its internal control structure, substantial capital expenditures, additional administration and operating expenses, retention of sufficiently skilled personnel to implement and operate the new systems, demands on management time and other risks and costs of delays or difficulties in transitioning to or integrating new systems into the Company's current systems. These implementations, modifications, and upgrades may not result in productivity improvements at a level that outweighs the costs of implementation, or at all. In addition, the difficulties with implementing new technology systems may cause disruptions in the Company's business operations and have a material adverse effect on its business, financial condition, or results of operations.

Security Breaches

As part of its day-to-day business, the Company stores its data and certain data about its customers in its global information technology system. Unauthorized access to the Company's data, including any regarding its customers, could expose the Company to a risk of loss of this information, loss of business, litigation and possible liability. These security measures may be breached by intentional misconduct by computer hackers, as a result of third-party action, employee error, malfeasance or otherwise. Additionally, third parties may attempt to fraudulently induce employees or customers into disclosing sensitive information such as usernames, passwords or other information in order to gain access to the data of the Company's customers or the Company's data, including the Company's intellectual property and other confidential business information, or the Company's information technology systems. Because the techniques used to obtain unauthorized access, or to sabotage systems, change frequently and generally are not recognized until launched against a target, the Company may be unable to anticipate these techniques or to implement adequate preventative measures. Any security breach could result in a loss of confidence by the Company's customers, damage its reputation, disrupt its business, lead to legal liability and negatively impact its future sales.

Public Health Crises

Public health crises, including local, regional, national or international outbreak of a contagious disease, could have an adverse effect on local economies, the global economy, and the markets in which the Company operates and markets its products, and may adversely impact the price and demand for the Company's products and the ability of the Company to operate and market its products. Any such alterations or modifications could cause substantial interruption to the Company's business, any of which could have a material adverse effect on the Company's operations or financial results, and could include temporary closures of one or more of the Company's or its partner's offices or facilities; temporary or long-term labor shortages; temporary or long-term adverse impacts on the Company's supply chain and distribution channels; the potential of increased network vulnerability and risk of data loss resulting from increased use of remote access and removal of data from the Company's facilities.

Subsequent to December 31, 2019, the global emergence of coronavirus (COVID-19) occurred. The global outbreak of COVID-19 has resulted in governments worldwide enacting emergency measures to protect against the spread of the virus. These measures, which include, among other things, limitations on travel, self-imposed quarantine periods and social distancing measures, have caused material disruption to businesses globally resulting in an economic slowdown. Global equity markets have experienced significant volatility and weakness. Governments and central banks have reacted with significant monetary and fiscal interventions designed to stabilize economic conditions. The duration and impact of the COVID-19 outbreak is unknown at this time, as is the efficacy of any government and/or central bank interventions. It is not possible to reliably estimate the length and severity of these developments and the impact on the financial results and condition of the Company in future periods.

As of the date of this MD&A, the Company has successfully continued operations under COVID-19 protocols. COVID-19 has not resulted in any material delays in the development or testing of the Company's products or any other material development projects. The Company is not currently experiencing any delays or interruptions in service or product delivery. At the outset of the COVID-19 pandemic, certain of the Company's operations were negatively impacted, but have since normalized. The Company has not experienced any material disruption in its supply chain, and the pandemic has not materially impacted the Company's business or delivery of services or products.

The Company's production schedule has continued throughout COVID-19 on a modified employee schedule, with certain non-production employees working remotely. The Company has been able to operate largely unaffected by the COVID-19 pandemic. Notwithstanding the foregoing, if the Company or its vendors and suppliers are unable to continue operations or keep up with increasing demands as a result of COVID-19, customers may experience delays or interruptions in service or the delivery of products, which may be detrimental to the Company's reputation, business, results of operations and financial position. The Company cautions that it is impossible to fully anticipate or quantify the effect and ultimate impact of the COVID-19 pandemic as the situation is rapidly evolving. The extent to which COVID-19 impacts the Company's results will depend on future developments, which are highly uncertain and cannot be predicted, including new information that may emerge concerning the severity of COVID-19 and the actions taken by governments to contain it or treat its impact, including shelter in place directives, which, if extended, may impact the economies in which the Company now operates, or may in the future operate, key markets into which the Company sells products and delivers services, and markets through which the Company's key suppliers source their products.

Litigation

The Company may from time to time become party to litigation in the ordinary course of business which could adversely affect its business. Should any litigation in which the Company becomes involved be determined against the Company, such a decision could adversely affect the Company's ability to continue operating and the market price for the Common Shares and could use significant resources. Even if the Company is involved in litigation and wins, litigation can redirect significant Company resources. Litigation may also create a negative perception of the Company's brand.

Trade Secrets May Be Difficult to Protect

The Company's success depends upon the skills, knowledge and experience of its scientific and technical personnel, consultants and advisors, as well as contractors. Because the Company operates in a highly competitive industry, it relies in part on trade secrets to protect its proprietary products and processes. However, trade secrets are difficult to protect. The Company generally enters into confidentiality or non-disclosure agreements with its corporate partners, employees, consultants, outside scientific collaborators, developers and other advisors. These agreements generally, require that the receiving party keep confidential, and not disclose to third parties, confidential information developed by the receiving party or made known to the receiving party by the Company during the course of the receiving party's relationship with the Company. These agreements also generally provide that inventions conceived by the receiving party in the course of rendering services to the Company will be its exclusive property, and the Company enters into assignment agreements to perfect its rights.

These confidentiality, inventions, and assignment agreements, where in place, may be breached and may not effectively assign intellectual property rights to the Company. The Company's trade secrets could also be independently discovered by competitors, in which case the Company would not be able to prevent the use of such trade secrets by its competitors. The enforcement of a claim alleging that a party illegally obtained and was using the Company's trade secrets could be difficult, expensive and time consuming and the outcome could be unpredictable. The failure to obtain or maintain meaningful trade secret protection could adversely affect the Company's competitive position.

Risks Related to Acquiring Companies

The Company may acquire other companies in the future and there are risks inherent in any such acquisition. Specifically, there could be unknown or undisclosed risks or liabilities of such companies for which the Company is not sufficiently indemnified. Any such unknown or undisclosed risks or liabilities could materially and adversely affect the Company's financial performance and results of operations. The Company could encounter additional transaction and integration-related costs or other factors such as the failure to realize all of the benefits from such acquisitions. All of these factors could cause dilution to the Company's earnings per share or decrease or delay the anticipated accretive effect of the acquisition and cause a decrease in the market price of the Company's securities. The Company may not be able to successfully integrate and combine the operations, personnel and technology infrastructure of any such acquired company with its existing operations. If integration is not managed successfully by the Company's management, the Company may experience interruptions in its business activities, deterioration of its employee and customer relationships, increased costs of integration and harm to its reputation, all of which could have a material adverse effect on the Company's business, financial condition and results of operations. The Company may experience difficulties in combining corporate cultures, maintaining employee morale and retaining key employees. The integration of any such acquired companies may also impose substantial demands on the management. There is no assurance that these acquisitions will be successfully integrated in a timely manner.

Global Economic Uncertainty

Demand for the Company's products and services are influenced by general economic and consumer trends beyond the Company's control. There can be no assurance that the Company's business and corresponding financial performance will not be adversely affected by general economic or consumer trends. In particular, global economic conditions are still tight, and if such conditions continue, recur or worsen, there can be no assurance that they will not have a material adverse effect on the Company's business, financial condition and results of operations.

Furthermore, such economic conditions have produced downward pressure on stock prices and on the availability of credit for financial institutions and corporations. If these levels of market disruption and volatility continue, the Company might experience reductions in business activity, increased funding costs and funding pressures, as applicable, a decrease in the market price of the Common Shares, a decrease in asset values, additional write-downs and impairment charges and lower profitability.

Inability to Renew Leases

The Company may be unable to renew or maintain its leases (commercial or real property) on commercially acceptable terms or at all. An inability to renew its leases, or a renewal of its leases with a rental rate higher than the prevailing rate under the applicable lease prior to expiration, may have an adverse impact on the Company's operations, including disruption of its operations or an increase in its cost of operations. In addition, in the event of non-renewal of any of the Company's leases, the Company may be unable to locate suitable replacement properties for its facilities or it may experience delays in relocation that could lead to a disruption in its operations. Any disruption in the Company's operations could have an adverse effect on its financial condition and results of operations.

Financial Reporting and Other Public Issuer Requirements

As a public company, the Company is subject to the reporting requirements of the Canadian Securities Administrators, or the CSA, and the U.S. Securities Exchange Act of 1934, as amended, and the rules and regulations of the listing standards of the TSX and NASDAQ and the U.S. Sarbanes-Oxley Act. The requirements of these laws, rules and regulations have increased and will continue to increase the Company's legal, accounting, and financial compliance costs, make some activities more difficult, time-consuming, and costly, and place significant strain on the Company's personnel, systems, and resources. The Company is continuing to develop and refine its disclosure controls and other procedures that are designed to ensure that information required to be disclosed by the Company in the reports that it will file with the CSA is recorded, processed, summarized, and reported within the time periods specified in CSA rules and forms and that information required to be disclosed in reports under applicable securities laws is accumulated and communicated to the Company's principal executive and financial officers. The Company is also continuing to improve its internal control over financial reporting. In order to improve the effectiveness of its disclosure controls and procedures and internal control over financial reporting, the Company has expended, and anticipate that it will continue to expend, significant resources, including accounting-related costs and significant management oversight.

The Company has identified certain material weaknesses in its internal controls, as more fully explained in its management's discussion and analysis for the year ended December 31, 2022, under "Disclosure Controls and Procedures". Additional weaknesses in the Company's disclosure controls and internal control over financial reporting may also be discovered in the future. Any failure to develop or maintain effective controls or any difficulties encountered in their implementation or improvement could harm the Company's results of operations or cause the Company to fail to meet its reporting obligations and may result in a restatement of the Company's consolidated financial statements for prior periods. Any failure to improve and maintain effective internal control over financial reporting also could adversely affect the results of periodic management evaluations and annual independent registered public accounting firm attestation reports regarding the effectiveness of the Company's internal control over financial reporting that the Company will eventually be required to include in its periodic reports that will be filed with the CSA. Ineffective disclosure controls and procedures and internal control over financial reporting could also cause investors to lose confidence in the Company's reported financial and other information, which could have a negative effect on the trading price of the Common Shares. In addition, if the Company is unable to continue to meet these requirements, it may not be able to remain listed on the TSX and/or NASDAQ.

Influence of the Significant Shareholders

To the Company's knowledge, no shareholder beneficially owns, or controls or directs, directly or indirectly, more than 10% of the voting rights attached to the Company's outstanding voting securities, except for Mr. Photis Peter Pascali, President and Chief Executive Officer of the Company, who holds or controls, directly or indirectly, 80,925,698 Common Shares, representing in aggregate 45.32% of the total voting rights attached to the outstanding Common Shares, and 2,500,000 share purchase warrants and options to acquire an additional 6,770,000 Common Shares (increasing the total number of Common Shares held or controlled, directly or indirectly, by him to 87,695,698 Common Shares, or 47.31% or the Common Shares, on a fully diluted basis). In addition, from time to time, the Company may have other shareholders who have the ability to exercise significant influence over matters submitted to the shareholders of the Company for approval, whether subject to approval by a majority of the shareholders of the Company or subject to a class vote or special resolution.

Limited Control Over the Company's Operations

Holders of the Common Shares have limited control over changes in the Company's policies and operations, which increases the uncertainty and risks of an investment in the Company. The Board determines major policies, including policies regarding financing, growth, debt capitalization and any future dividends to shareholders of the Company. Generally, the Board may amend or revise these and other policies without a vote of the holders of the Common Shares. The Board's broad discretion in setting policies and the limited ability of holders of the Common Shares to exert control over those policies increases the uncertainty and risks of an investment in the Company.

Change in Tax Laws

New income, sales, use or other tax laws, statutes, rules, regulations or ordinances could be enacted at any time. Further, existing tax laws, statutes, rules, regulations or ordinances could be interpreted, changed, modified or applied adversely to the Company. These enactments and events could require the Company to pay additional tax amounts on a prospective or retroactive basis, thereby substantially increasing the amount of taxes the Company is liable to pay in the relevant tax jurisdictions. Accordingly, these events could decrease the capital that the Company has available to operate its business. Any or all of these events could harm the business and financial performance of the Company.

Forward-Looking Information

The forward-looking information included in this MD&A relating to, among other things, the Company's future results, performance, achievements, prospects, targets, intentions or opportunities or the markets in which it operates and the other statements listed are based on opinions, assumptions and estimates made by the Company's management in light of its experience and perception of historical trends, current conditions and expected future developments, as well as other factors that the Company believes are appropriate and reasonable in the circumstances. However, there can be no assurance that such estimates and assumptions will prove to be correct. The Company's actual results in the future may vary significantly from the historical and estimated results and those variations may be material. The Company makes no representation that its actual results in the future will be the same, in whole or in part, as those included in this MD&A.

Credit Facilities

The Company's credit facilities and financing agreements mature on various dates. There can be no assurance that such credit facilities or financing agreements will be renewed or refinanced, or if renewed or refinanced, that the renewal or refinancing will occur on equally favourable terms to the Company. The Company's ability to continue operating may be adversely affected if the Company is not able to renew its credit facilities or arrange refinancing, or if such renewal or refinancing, as the case may be, occurs on terms materially less favorable to the Company than at present. The Company's current credit facilities and financing agreements have no imposed financial covenants and obligations on the Company. In the event of the contrary, there is a risk that such loans may go into default if there is a breach in complying with such covenants and obligations, which could result in the lenders realizing on their security and causing our shareholders to lose some or all of their investment.

Risks Related to the Company's Securities

Potential Volatility of Common Share Price

The market price of the Common Shares could be subject to significant fluctuations. Some of the factors that may cause the market price of the Common Shares to fluctuate include:

(i) the public's reaction to the Company's press releases, announcements and filings with regulatory authorities and those of its competitors;

(ii) fluctuations in broader stock market prices and volumes;

(iii) changes in market valuations of similar companies;

(iv) investor perception of the Company, its prospects or the industry in general;

(v) additions or departures of key personnel;

(vi) commencement of or involvement in litigation;

(vii) announcements by the Company or its competitors of strategic alliances, significant contracts, new technologies, acquisitions, commercial relationships, joint ventures or capital commitments;

(viii) variations in the Company's quarterly results of operations or cash flows or those of other comparable companies;

(ix) revenues and operating results failing to meet the expectations of securities analysts or investors in particular quarter;

(x) changes in the Company's pricing policies or the pricing policies of its competitors;

(xi) future issuances and sales of Common Shares;

(xii) sales of Common Shares by insiders of the Company;

(xiii) third party disclosure of significant short positions;

(xiv) demand for and trading volume of Common Shares;

(xv) changes in securities analysts' recommendations and their estimates of the Company's financial performance;

(xvi) short-term fluctuation in stock price caused by changes in general conditions in the domestic and worldwide economies or financial markets; and

(xvii) the other risk factors described under this heading of the MD&A.

The realization of any of these risks and other factors beyond the Company's control could cause the market price of the Common Shares to decline significantly.

In addition, broad market and industry factors may harm the market price of the Common Shares. Hence, the price of the Common Shares could fluctuate based upon factors that have little or nothing to do with the Company, and these fluctuations could materially reduce the price of the Common Shares regardless of the Company's operating performance. In the past, following a significant decline in the market price of a company's securities, there have been instances of securities class action litigation having been instituted against that company. If the Company were involved in any similar litigation, it could incur substantial costs, management's attention and resources could be diverted and it could harm the Company's business, operating results and financial condition.

Market Liquidity

The market price for the Common Shares could be subject to wide fluctuations. Factors such as the announcement of significant contracts, technological innovations, new commercial products, patents, a change in regulations, quarterly financial results, future sales of Common Shares by the Company or current shareholders, and many other factors could have considerable repercussions on the price of the Common Shares. In addition, the financial markets may experience significant price and value fluctuations that affect the market prices of equity securities of companies that sometimes are unrelated to the operating performance of these companies. Broad market fluctuations, as well as economic conditions generally may adversely affect the market price of the Common Shares.

Dividends to Shareholders

The Company does not anticipate paying cash dividends on the Common Shares in the foreseeable future. The Company currently intends to retain all future earnings to fund the development and growth of its business. Any payment of future dividends will be at the discretion of the directors and will depend on, among other things, the Company's earnings, financial condition, capital requirements, level of indebtedness, statutory and contractual restrictions applying to the payment of dividends, and other considerations that the directors deems relevant.

Impact of Future Sales by Existing Shareholders

If the Company's shareholders sell substantial amounts of the Common Shares in the public market, the market price of the Common Shares could decrease. The perception among investors that these sales will occur could also produce this effect. All currently outstanding Common Shares other than those subject to lock-up agreements executed by certain existing shareholders will, subject to applicable securities laws, generally be immediately available for resale in the public markets.

Subject to compliance with applicable securities laws, the Company's officers, directors and their affiliates may sell some or all of their Common Shares in the future. No prediction can be made as to the effect, if any, such future sales of Common Shares will have on the market price of the Common Shares prevailing from time to time. However, the future sale of a substantial number of Common Shares by the Company's officers, directors and their affiliates, or the perception that such sales could occur, could materially adversely affect prevailing market prices for the Common Shares.

Additional Common Shares issuable upon the exercise of stock options may also be available for sale in the public market, which may also cause the market price of the Common Shares to fall. Accordingly, if substantial amounts of Common Shares are sold in the public market, the market price could fall.

Working Capital and Future Issuances

The Company may issue additional Common Shares in the future which may dilute a shareholder's holdings in the Company. The Articles permit the issuance of an unlimited number of Common Shares, and shareholders of the Company will have no pre-emptive rights in connection with any further issuances The directors of the Company have the discretion to determine the provisions attaching to the Common Shares and the price and the terms of issue of further Common Shares.

Additional equity financing may be dilutive to holders of Common Shares. Debt financing may involve restrictions on the Company's financing and operating activities. Debt financing may be convertible into other securities of the Company which may result in immediate or resulting dilution. In either case, additional financing may not be available to the Company on acceptable terms or at all. If the Company is unable to raise additional funds as needed, the scope of its operations or growth may be reduced and, as a result, the Company may be unable to fulfill its long-term goals. In this case, investors may lose all or part of their investment. Any default under such debt instruments could have a material adverse effect on the Company, its business or the results of operations.

Securities or Industry Analysts

The trading market for Common Shares could be influenced by the research and reports that industry and/or securities analysts may publish about the Company, its business, the market or competitors. If any of the analysts who may cover the Company's business change their recommendation regarding the Common Shares adversely, or provide more favourable relative recommendations about its competitors, the share price would likely decline. If any analyst who may cover the Company's business were to cease coverage or fail to regularly publish reports on the Company, it could lose visibility in the financial markets, which in turn could cause the share price or trading volume to decline.

Risks Related to the Company's Status as a Foreign Private Issuer

Information Publicly Available to the Company's U.S. shareholders

The Company is a foreign private issuer under applicable U.S. federal securities laws. As a result, the Company does not file the same reports that a U.S. domestic issuer would file with the U.S. Securities and Exchange Commission (the "SEC"), although the Company is required to file with or furnish to the SEC the continuous disclosure documents that the Company is required to file in Canada under Canadian Securities Laws, in certain respects the reporting obligations are less detailed and less frequent than those of U.S. domestic reporting companies. In addition, the Company's officers, directors and principal shareholders are exempt from the reporting and short-swing profit recovery provisions of Section 16 of the U.S. Exchange Act. Therefore, the Company's shareholders may not know on as timely a basis when the Company's officers, directors and principal shareholders purchase or sell Common Shares as the reporting periods under the corresponding Canadian insider reporting requirements are longer.

As a foreign private issuer, the Company is exempt from the rules and regulations under the Exchange Act related to the furnishing and content of proxy statements. The Company is also exempt from Regulation FD, which prohibits issuers from making selective disclosures of material non-public information. While the Company complies with the corresponding requirements relating to proxy statements and disclosure of material non-public information under Canadian securities laws, these requirements differ from those under the Exchange Act and Regulation FD and shareholders should not expect to receive the same information at the same time as such information is provided by U.S. domestic companies. In addition, the Company may not be required under the Exchange Act to file annual and quarterly reports with the SEC as promptly as U.S. domestic companies whose securities are registered under the Exchange Act.

In addition, as a foreign private issuer, the Company has the option to follow certain Canadian corporate governance practices, except to the extent that such laws would be contrary to U.S. securities laws, and provided that the Company discloses the requirements it is not following and describe the Canadian practices it follows instead. The Company plans to rely on this exemption. As a result, the Company's shareholders may not have the same protections afforded to shareholders of U.S. domestic companies that are subject to all U.S. corporate governance requirements.

Loss of Foreign Private Issuer Status in the Future

In order to maintain its status as a foreign private issuer, a majority of the Company's Common Shares must be either directly or indirectly owned by non-residents of the U.S. unless the Company also satisfies one of the additional requirements necessary to preserve this status. The Company may in the future lose its foreign private issuer status if a majority of the Common Shares are held in the United States and the Company fails to meet the additional requirements necessary to avoid loss of foreign private issuer status. The regulatory and compliance costs to the Company under U.S. federal securities laws as a U.S. domestic issuer may be significantly more than the costs the Company incurs as a Canadian foreign private issuer eligible to use the multi-jurisdictional disclosure system ("MJDS"). If the Company is not a foreign private issuer, it would not be eligible to use the MJDS or other foreign issuer forms and would be required to file periodic and current reports and registration statements on U.S. domestic issuer forms with the SEC, which are more detailed and extensive than the forms available to a foreign private issuer. In addition, the Company may lose the ability to rely upon exemptions from NASDAQ corporate governance requirements that are available to foreign private issuers.

Inability for U.S. Investors to Enforce Certain Judgments

The Company is a corporation existing under the Canada Business Corporations Act. A number of the Company's directors and officers are residents of Canada, and substantially all of the Company's assets are located outside the United States. As a result, it may be difficult to effect service within the United States upon the Company or upon its directors and officers. Execution by United States courts of any judgment obtained against the Company or any of the Company's directors or officers in United States courts may be limited to the assets of such companies or such persons, as the case may be, located in the United States. It may also be difficult for holders of securities who reside in the United States to realize in the United States upon judgments of courts of the United States predicated upon civil liability and the civil liability of the Company's directors and executive officers under the United States federal securities laws. The Company has been advised that a judgment of a U.S. court predicated solely upon civil liability under U.S. federal securities laws or the securities or "blue sky" laws of any state within the United States, would likely be enforceable in Canada if the United States court in which the judgment was obtained has a basis for jurisdiction in the matter that would be recognized by a Canadian court for the same purposes. However, there may be doubt as to the enforceability in Canada against these non-U.S. entities or their controlling persons, directors and officers who are not residents of the United States, in original actions or in actions for enforcement of judgments of courts of the United States, of liabilities predicated solely upon U.S. federal or state securities laws.

Risks Relating to the Company's Status as an "Emerging Growth Company" Under U.S. Securities Laws

The Company is an "emerging growth company" as defined in section 3(a) of the Exchange Act (as amended by the JOBS Act, enacted on April 5, 2012), and the Company will continue to qualify as an emerging growth company until the earliest to occur of: (a) the last day of the fiscal year during which the Company has total annual gross revenues of US$1,070,000,000 (as such amount is indexed for inflation every five years by the SEC) or more; (b) the last day of the fiscal year of the Company following the fifth anniversary of the date of the first sale of common equity securities of the Company pursuant to an effective registration statement under the United States Securities Act of 1933, as amended; (c) the date on which the Company has, during the previous three year period, issued more than US$1,000,000,000 in non-convertible debt; and (d) the date on which the Company is deemed to be a "large accelerated filer", as defined in Rule 12b-2 under the Exchange Act. The Company will qualify as a large, accelerated filer (and would cease to be an emerging growth company) at such time when on the last business day of its second fiscal quarter of such year the aggregate worldwide market value of its common equity held by non-affiliates will be US$700,000,000 or more.

For so long as the Company remains an emerging growth company, it is permitted to and intends to rely upon exemptions from certain disclosure requirements that are applicable to other public companies that are not emerging growth companies. These exemptions include not being required to comply with the auditor attestation requirements of Section 404 of the JOBS Act. The Company takes advantage of some, but not all, of the available exemptions available to emerging growth companies. The Company cannot predict whether investors will find the Common Shares less attractive because the Company relies upon certain of these exemptions. If some investors find the Common Shares less attractive as a result, there may be a less active trading market for the Common Shares and the Common Share price may be more volatile. On the other hand, if the Company no longer qualifies as an emerging growth company, the Company would be required to divert additional management time and attention from the Company's development and other business activities and incur increased legal and financial costs to comply with the additional associated reporting requirements, which could negatively impact the Company's business, financial condition and results of operations.

OUTLOOK

In 2022, PyroGenesis remained focused on driving its major lines of business toward widespread acceptance, moving its newer innovations closer to commercialization, finding efficiencies, and maintaining margin – all while providing the type of superior service and solutions that have endeared the Company to large global public, private, and government partners.

The information below represents important highlights from the past year, followed by an outline of the company's strategy and outlook for 2023.

Key Strategic Actions

Major Deliverables

- **Titanium Powder Commercial Orders:** During 2022, the Company announced it had received and completed its first two commercial orders for Titanium powders using its NexGen™ plasma atomization process. The first, for 100 kg, was under its mutually exclusive partnership agreement with Aubert & Duval, a major supplier of metal powders for additive manufacturing serving the Aerospace, Energy, Transport, Medical, Defense, and Automotive sectors; the second, also for 100 kg, was to a confidential customer.

- **Iron Ore Pelletization Torches:** During 2022, the Company continued to progress its major initiative to supply electric plasma torch systems to large iron ore companies for first-ever trials in this important upstream part of the steelmaking process. In July 2022, the first plasma system plus required components was completed and delivered to a client. Subsequent to year-end 2022, in January 2023, four electric plasma torch systems plus required components were delivered to a second client. These clients are two of the largest iron ore companies in the world and each has made a significant financial and logistical commitment over the past two years to test plasma as a possible replacement for the diesel and/or natural gas furnace burners needed for iron ore pellet baking. Live onsite trials and testing will be conducted per client-defined scheduling, based on the Client's own resourcing and logistical decisions of which the Company has no input.

- **Metal Powder Aerospace Client Qualification:** In September 2022, the Company announced it had completed the in-house quality audit of its NexGen™ metal powder production facility and process, which it also later passed subsequent to year-end 2022, by a large global aerospace client. The in-house audit was part of an almost two year long process of qualification by the client, towards an end-goal of being a certified supplier of titanium metal powders to the client, its suppliers, and service centers. With the audit completed, the last step is a testing of the Company's powders, which will be conducted per client-defined scheduling.

Innovations

- **Aluminum Scrap Remelting:** in May 2022, the Company announced it had undertaken a joint evaluation with a major manufacturer to test PyroGenesis' zero-emission plasma torches in the Client's aluminum scrap remelting and holding furnaces. This was one of several secondary or tertiary aluminum producers who are investigating the Company's electric plasma torches to replace fossil fuels in recycled aluminum production, holding tank heating, or cast houses.

- **Carbon-anode baking:** The Company announced in June 2022 it had undertaken a joint initiative with a premier applied engineering and process optimization firm in the global aluminum industry, focused on utilizing PyroGenesis' zero-emission plasma torches in carbon anode baking – a vital upstream step in the aluminum production process. Carbon anodes, which are used as an electrical conductor during the aluminum smelting process but constantly consumed, are traditionally produced using natural gas baking; reducing fossil fuel use while optimizing the anode baking process is an objective in the industry for manufacturers of high-grade anodes.

- **Spent-pot linings:** The Company continues to progress the previously announced initiative to develop a solution to recover residues of aluminum pot linings, in conjunction with project partner Aluminerie Alouette (co-owned by Rio Tinto and Norsk Hydro), the largest primary aluminum smelter in the Americas. The solution under development is intended to safely recover valuable metals and various compounds from the heavily contaminated carbon-lined cells or "pots" from inside a smelter, which degrade over time and must be removed and safely disposed. The project evolved throughout 2022, with additional technology benchmarks being met, and with the Company and Aluminerie Alouette deepening their relationship with a further commitment.

- **Magnesium Recovery and Valourization:** in September 2022, the Company announced it was selected by an international producer of magnesium metal to develop two processes: a method to clean and decontaminate particulate matter produced during primary magnesium production, and to process the metal waste stream known as dross, for the purpose of recovering valuable metal. Dross recovery is not widespread in the magnesium industry, due to the complexity of the process and the inherent challenges of working with magnesium – a very combustible and volatile metal that is highly reactive to oxygen. With PyroGenesis' expertise in recovering high-value metal from dross in other industries (such as aluminum), the Company believes it has the solution to the specific challenges posed by magnesium, potentially opening a large opportunity for growth, while decreasing the Client's environmental impact.

- **Turquoise Hydrogen Production:** The Company continues to progress the previously announced initiative to produce an environmentally friendly hydrogen. In November 2022, the Company successfully produced hydrogen from methane using this ZCE hydrogen production technology which, because it uses electricity in the form of plasma, rather than combustion of fossil fuels, is typically referred to as "Turquoise Hydrogen". A solid carbon byproduct that has many industrial applications (including the production of car tires, coatings, plastics, and batteries), and is considered an essential raw material, is also produced through the process.

Operational

- **European Metal Powders Production:** Throughout 2022, the Company continued to evolve its strategy, first announced in July 2022, for European market expansion for its titanium metal powder line of business. With the goal to eventually build and operate a metal powder production facility in Europe. Subsequent to year-end 2022, in Q1 2023 the Company announced expansion of its strategy team, with the hiring of a key Europe-based executive with a long track-record across sales, marketing, and business process in the metals industry, particularly the aerospace, space, and defense markets.

- **Quality Management Process Certification:** In November 2022, the Company passed its annual quality audit for two key international standards: ISO 9001:2015, and AS9100D, the latter being a quality management designation specific to the aerospace industry. The audits encompassed all of PyroGenesis' facilities for the purpose of meeting compliance with the existing quality management designations. Additionally, as a result of this audit, the Company's newest facility located at 9371 Wanklyn St. in LaSalle, Quebec, was officially added to the ISO 9001:2015 certification. Separately, the Company continues its path to become ISO 13485:2016 certified, a Quality Management System designation required by most manufacturers within the medical devices and related services industry.

Financial

- **Private Placement:** In October 2022, the Company announced the completion of a non-brokered private placement consisting of the issuance and sale of 1,014,600 units of the Corporation at a price of $1.30 per Unit, for gross proceeds of $1,318,980 to the Company. The closing price of the common shares of the Company on October 18, 2022, the last trading day prior to the closing of the Private Placement, was $1.17. Each Unit consists of one common share of the Company and one Common Share purchase warrant. Each Warrant entitles the holder thereof to purchase one Common Share at a price of $1.75 until October 19, 2024. The Common Shares and Warrants issued in connection with the Private Placement, and the Common Shares underlying the Warrants, are subject to a statutory hold period of four months and one day from the date of closing, in accordance with applicable securities legislation.

Outlook

Consistent with the Company's past practice, and in view of the early stage of market adoption of our core lines of business, we are not providing specific revenue or net income (loss) guidance for 2023.
In 2023, we continue our plan to increase sales, marketing, and R&D efforts in-line – and in some cases ahead of – the growth curve for industrial change related to greenhouse gas reduction efforts. This includes expanded technology offering and capabilities across the industrial value chain, using an updated strategy that sees the Company bundle its solution-set into verticals that represent key economic drivers for heavy industry.

Overall Strategy

PyroGenesis' provides technology solutions to heavy industry that leverage off the Company's proprietary position and expertise in ultra-high temperature processes. The Company has evolved from its early roots of being a speciality-engineering firm to being a provider of a robust technology eco-system for heavy industry that helps address key strategic goals.

Aligning Business Lines to Economic Drivers

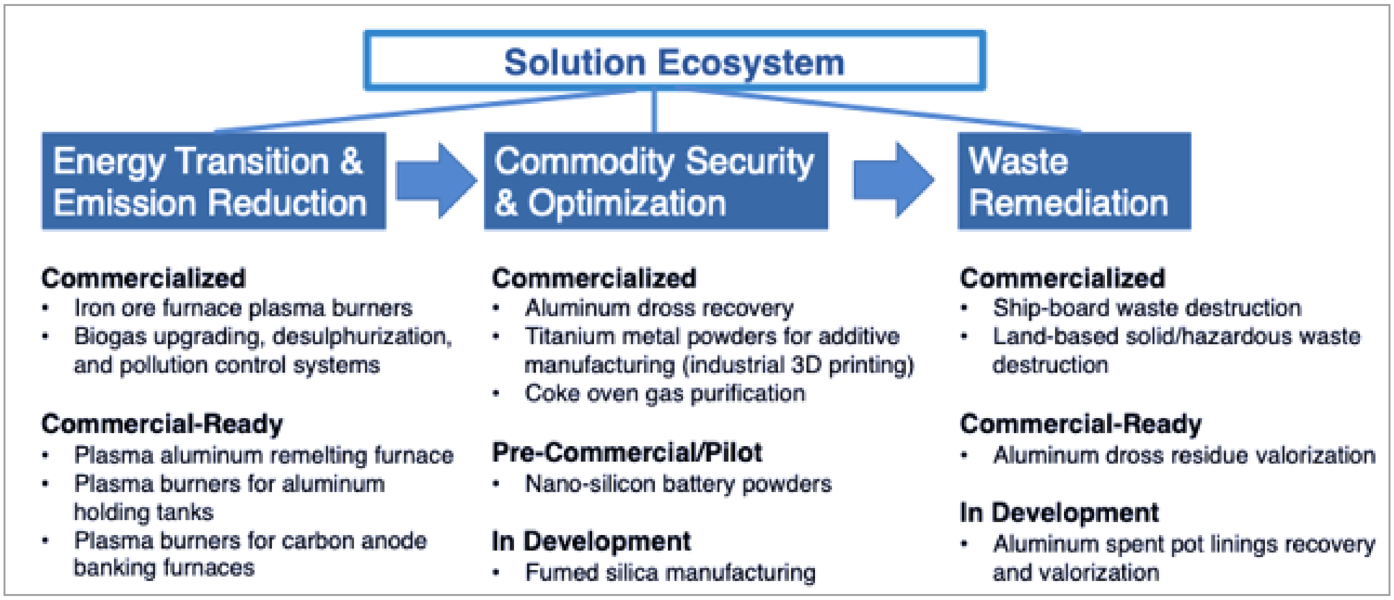
As interest in the Company's products has increased, and the variety of uses for its core technologies has expanded, the Company has evolved its strategy to concentrate its solution set under three categories. These categories represent economic drivers that are key to global heavy industry:

1. **Energy Transition & Emission Reduction:**
   - fuel switching, utilizing the Company's electric-powered plasma torches and biogas upgrading technology to help heavy industry reduce fossil fuel use and greenhouse gas emissions.

2. **Commodity Security & Optimization:**
   - recovery of viable metals, and optimization of production to increase output, to maximize raw materials and improve availability of critical minerals.

3. **Waste Remediation:**
   - safe destruction of hazardous materials, and the recovery and valorization of underlying substances such as chemicals and minerals.

Within each category the Company offers several solutions at different stages leading up to commercialization, including the partial list in the diagram below:



The Company's believes its strategy to be timely, as multiple heavy industries are committing to major carbon and waste reduction targets at the same time as many governments are increasingly funding environmental technologies and infrastructure projects – all while both are making efforts to ensure the availability of critical minerals during the coming decades of increased output demand.

While there can be no guarantee, the Company believes this evolution of its strategy beyond a greenhouse gas emission reduction emphasis, to an expanded focus that encapsulates the key verticals listed above, both improves the Company's chances for success while also providing a clearer picture of how the Company's wide array of offerings work in tandem to support heavy industry goals.

PyroGenesis' market opportunity remains large, as major industries such as aluminum, steelmaking, manufacturing, and government require factory-ready, technology-based solutions to help steer through the paradoxical landscape of increasing demand and tightening regulations and material availability.

As more of the Company's offerings reach full commercialization, PyroGenesis will remain focused on attracting influential customers in broad markets and ensuring that operating expenses are controlled to achieve profitable growth.

FURTHER INFORMATION

Additional information relating to Company and its business, including the 2022 consolidated financial statements, the Annual Information Form and other filings that the Company has made and may make in the future with applicable securities authorities, may be found on or through SEDAR at www.sedar.com, EDGAR at www.sec.gov or the Company's website at www.pyrogenesis.com.

Additional information, including directors' and officers' remuneration and indebtedness, principal holders of the Company's securities and securities authorized for issuance under equity compensation plans, is also contained in the Company's most recent management information circular for the most recent annual meeting of shareholders of the Company.