

# **PyroGenesis Canada Inc.**

## **Management's Discussion and Analysis**

### **For the years ended December 31, 2021, and 2020**

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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, 2021. 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, 2021. (the "2021 consolidated Financial Statements") and the Company's annual information form for the year ended December 31, 2021 (the "Annual Information Form").

The 2021 consolidated Financial Statements and MD&A have been reviewed by PyroGenesis' Audit Committee and were approved by its Board of Directors on March 31, 2022. 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 31, 2022, 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](http://www.sedar.com), the Electronic Data Gathering, Analysis, and Retrieval system ("EDGAR") at [www.sec.gov](http://www.sec.gov), and on the Company's website at [www.pyrogenesis.com](http://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.

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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

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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 2021 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 2021 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 2021 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, Adjusted EBITDA and Modified EBITDA. EBITDA, Adjusted EBITDA and Modified EBITDA 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. These non-IFRS measures are used to provide investors with supplemental measures of operating performance and thus highlight trends in our business that may not otherwise be apparent when relying solely on IFRS measures. We also believe that securities analysts, investors and other interested parties frequently use non-IFRS measures in the evaluation of issuers. Our management also uses non-IFRS measures 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, Adjusted EBITDA and Modified EBITDA are important measures of operating performance because it allows management, investors and others to evaluate and compare the Company's operating results, including its return on capital and operating efficiencies, from period-to-period by removing the impact of the Company's capital structure consequences, and other non-operating items not requiring cash outlays including the adjustment to the fair value of investments and share-based compensation.

**EBITDA**

We define EBITDA as Net Earnings before Net Financing Charges, Income Taxes, Depreciation and Amortization. See "Results of Operations - Reconciliation of Non-IFRS measures (EBITDA,

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Adjusted EBITDA and Modified EBITDA)".

Adjusted EBITDA

We define Adjusted EBITDA as Net Earnings before Net Financing Charges, Income Taxes, Depreciation, Amortization and other non-cash items including share-based payment costs. See "Results of Operations - Reconciliation of Non-IFRS measures (EBITDA, Adjusted EBITDA and Modified EBITDA)".

Modified EBITDA

We defined Modified EBITDA as Adjusted EBITDA before the change in fair value of strategic investments. See "Results of Operations - Reconciliation of Non-IFRS measures (EBITDA, Adjusted EBITDA and Modified EBITDA)".

**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 m<sup>2</sup>) and 31,632 sq. ft. (2,940 m<sup>2</sup>) 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).

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**INFORMATION FROM STATEMENT OF COMPREHENSIVE INCOME FOR THE QUARTERS AND YEARS ENDED DECEMBER 31:**

	Three months ended Dec 31		% Change	Twelve months ended Dec 31		% Change
	2021	2020	2021vs2020	2021	2020	2021vs2020
<b>Revenues</b>	<b>\$ 7,205,349</b>	<b>\$ 6,778,240</b>	<b>6%</b>	<b>\$ 31,068,350</b>	<b>\$ 17,775,029</b>	<b>75%</b>
Cost of sales and services	<b>5,902,560</b>	3,542,104	67%	<b>18,636,539</b>	7,472,361	149%
Gross margin	<b>1,302,789</b>	3,236,136	-60%	<b>12,431,811</b>	10,302,668	21%
<b>Expenses</b>						
Selling, general and administrative (not including share-based expenses)	<b>7,071,471</b>	2,948,488	140%	<b>17,474,390</b>	8,089,945	116%
Research and development	<b>1,149,140</b>	(882,253)	230%	<b>2,535,987</b>	(731,077)	447%
Total expenses (not including share-based expenses)	<b>8,220,611</b>	2,066,235	298%	<b>20,010,377</b>	7,358,868	172%
Net (loss) income from operations (not including share-based expenses)	<b>(6,917,822)</b>	1,169,901	-691%	<b>(7,578,566)</b>	2,943,800	-357%
Share-based expenses	<b>(4,878,526)</b>	(1,132,696)	331%	<b>(9,762,745)</b>	(4,244,608)	130%
Net (loss) income from operations	<b>(11,796,348)</b>	37,206	-31805%	<b>(17,341,311)</b>	(1,300,808)	1233%
Changes in fair market value of strategic investments and financial expenses	<b>(11,349,913)</b>	23,967,621	-147%	<b>(21,830,588)</b>	44,102,624	-149%
Income taxes	<b>(739,960)</b>	1,033,412	-172%	<b>(739,960)</b>	1,033,412	-172%
<b>Net earnings (loss)</b>	<b>\$ (22,406,301)</b>	<b>\$ 22,971,415</b>	<b>-198%</b>	<b>\$ (38,431,939)</b>	<b>\$ 41,768,404</b>	<b>192%</b>
Foreign currency translation gain on investments in foreign operations	<b>3,444</b>	-	100%	<b>3,444</b>	-	100%
<b>Comprehensive income (loss)</b>	<b>\$ (22,402,857)</b>	<b>22,971,415</b>	<b>-198%</b>	<b>\$ (38,428,495)</b>	<b>41,768,404</b>	<b>-192%</b>
<b>Earnings (loss) per share</b>						
Basic	<b>\$ (0.13)</b>	\$ 0.15		<b>\$ (0.23)</b>	\$ 0.28	
Diluted	<b>\$ (0.13)</b>	\$ 0.15		<b>\$ (0.23)</b>	\$ 0.27	
<b>Modified EBITDA <sup>(1)</sup></b>	<b>\$ (6,522,877)</b>	<b>\$ 1,302,357</b>	<b>-601%</b>	<b>\$ (6,182,695)</b>	<b>\$ 3,442,443</b>	<b>-280%</b>

<sup>1</sup> See "Non-IFRS Measures"

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**INFORMATION FROM CONSOLIDATED STATEMENT OF COMPREHENSIVE INCOME FOR THE YEARS ENDED DECEMBER 31:**

	Dec 31, 2021	Dec 31, 2020	Dec 31, 2019
<b>Revenues</b>	<b>\$ 31,068,350</b>	\$ 17,775,029	\$ 4,813,978
Cost of sales and services	<b>18,636,539</b>	7,472,361	3,515,886
Gross margin	<b>12,431,811</b>	10,302,668	1,298,092
<b>Expenses</b>			
Selling, general and administrative (not including share-based expenses)	<b>17,474,390</b>	8,089,945	6,017,091
Research and development	<b>2,535,987</b>	(731,077)	851,512
Impairment of plasma automation system & Write-off of inventories	-	-	2,367,531
Total expenses (not including share-based expenses)	<b>20,010,377</b>	7,358,868	9,236,134
Net (loss) income from operations (not including share-based expenses)	<b>(7,578,566)</b>	2,943,800	(7,938,042)
Share-based expenses	<b>(9,762,745)</b>	(4,244,608)	(171,807)
Net (loss) income from operations	<b>(17,341,311)</b>	(1,300,808)	(8,109,849)
Changes in fair market value of strategic investments and financial expenses	<b>(21,830,588)</b>	44,102,624	(1,061,267)
Income taxes	<b>(739,960)</b>	1,033,412	-
<b>Net income (loss) and comprehensive income (loss)</b>	<b>\$ (38,431,939)</b>	\$ 41,768,404	\$ (9,171,116)
Foreign currency translation gain on investments in foreign operations	<b>3,444</b>	-	-
<b>Comprehensive income (loss)</b>	<b>\$ (38,428,495)</b>	\$ 41,768,404	\$ (9,171,116)
<b>Earnings (loss) per share</b>			
Basic	<b>\$ (0.23)</b>	\$ 0.28	\$ (0.07)
Diluted	<b>\$ (0.23)</b>	\$ 0.27	\$ (0.07)
<b>Modified EBITDA <sup>(1)</sup></b>	<b>\$ (6,182,695)</b>	\$ 3,442,443	\$ (5,021,761)

<sup>1</sup> See "Non-IFRS Measures"

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**SELECTED FINANCIAL INFORMATION**

	Dec 31, 2021	Dec 31, 2020	Dec 31, 2019
Current assets	<b>38,758,984</b>	25,336,787	1,324,554
Non-current assets	<b>31,011,693</b>	49,194,591	8,254,675
<b>Total assets</b>	<b>\$ 69,770,677</b>	\$ 74,531,378	\$ 9,579,229
Current liabilities	<b>24,752,199</b>	11,539,208	11,816,655
Non-current liabilities	<b>4,249,724</b>	3,569,064	3,845,497
<b>Total liabilities</b>	<b>\$ 29,001,923</b>	\$ 15,108,272	\$ 15,662,152
<b>Shareholders' equity</b>	<b>\$ 40,768,754</b>	\$ 59,423,106	\$ (6,082,923)

**RESULTS OF OPERATIONS**

***Revenues***

PyroGenesis recorded revenues of \$31,068,350 for the year ended December 31, 2021, representing an increase of 75% compared to \$17,775,029 recorded in 2020.

Revenues recorded in fiscal 2021 were generated primarily from:

- (i) PUREVAP™ related sales of \$6,138,111 (2020 - \$4,163,059)
- (ii) DROSRITE™ related sales of \$7,940,771 (2020 - \$9,976,696)
- (iii) support services related to systems supplied to the US Navy \$7,522,809 (2020 - \$1,425,883)
- (iv) torch related sales of \$2,084,511 (2020 - \$1,452,455)
- (v) biogas upgrading & pollution controls of \$6,800,090 (2020 - \$Nil)
- (vi) other sales and services \$582,058 (2020 - \$756,936)

PUREVAP™ related sales includes revenue from the sale of technologies in the amount of \$3,300,000. See note 6 to the 2021 consolidated Financial Statements.

As of March 31, 2022, revenue expected to be recognized in the future related to performance obligations that are unsatisfied (or partially satisfied) is \$47,661,216. 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		
	2021	2020	2021vs2020	2021	2020	2021vs2020	2021	2020	2021vs2020	2021	2020	2021vs2020
Employee compensation	\$ 769,322	\$ 471,893	63%	\$ 2,650,739	\$ 1,379,637	92%						
Subcontracting	210,848	611,396	-66%	872,933	1,281,472	-32%						
Direct materials	4,498,835	2,134,300	111%	14,252,205	4,147,704	244%						
Manufacturing overhead & other	434,778	159,072	173%	1,111,975	507,217	119%						
Foreign exchange charge on materials	(306,918)	114,237	-369%	(568,531)	147,561	-485%						
Investment tax credits	(65,326)	44,424	247%	(148,695)	(18,420)	707%						
<b>Cost of Sales and Services before Amortization of Intangible Assets</b>	<b>\$ 5,541,539</b>	<b>\$ 3,535,322</b>	<b>57%</b>	<b>\$ 18,170,626</b>	<b>7,445,171</b>	<b>144%</b>						
Amortization of intangible assets	361,021	6,782	5223%	465,913	27,190	1614%						
<b>Total Cost of Sales and Services</b>	<b>\$ 5,902,560</b>	<b>\$ 3,542,104</b>	<b>67%</b>	<b>\$ 18,636,539</b>	<b>\$ 7,472,361</b>	<b>149%</b>						

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**Gross Margin**

	Three months ended Dec 31		Twelve months ended Dec 31	
	2021	2020	2021	2020
Revenues	\$ 7,205,349	\$ 6,778,240	\$ 31,068,350	\$ 17,775,029
Cost of Sales and Services	5,902,560	3,542,104	18,636,539	7,472,361
Gross Margin	\$ 1,302,789	\$ 3,236,135	\$ 12,431,811	\$ 10,302,668
Gross Margin %	18.1%	47.7%	40.0%	58.0%

Cost of sales and services before amortization of intangible assets is not a performance measure defined under IFRS and it is not considered an alternative to gross margin in the context of measuring the Company's performance. Management believes that providing certain non-GAAP performance measures, in addition to IFRS measures, provides users of the Company's consolidated financial statements with an enhanced understanding of its results and related trends, and increases transparency and clarity. Gross margin before amortization of intangible assets is an important measure of operating performance because it allows management, investors and others to evaluate and compare the Company's core operating results, including its return on capital and operating efficiencies, from period to period, by removing the impact of items not requiring cash outlays. Securities regulations require that companies caution readers that earnings and other measures adjusted to a basis other than IFRS do not have standardized meanings and are unlikely to be comparable to similar measures used by other companies. Accordingly, they should not be considered in isolation or a substitute for financial measures prepared in accordance with IFRS.

Cost of sales and services before amortization of intangible assets was \$18,170,626 in 2021, representing an increase of 144% compared to \$7,445,171 in 2020, primarily due to the additional costs to complete the Pyro Green-Gas contracts following the acquisition. Increases in employee compensation \$2,650,739 (2020 - \$1,379,637), direct materials \$14,252,205 (2020 - \$4,147,704), manufacturing overhead & other \$1,111,975 (2020 - \$507,217), were offset by a decrease in subcontracting \$872,933 (2020 - \$1,281,472), foreign exchange charge on materials (\$568,531) (2020 - \$147,561) and an increase in investment tax credits (\$148,695) (2020 - (\$18,420)).

In 2021, employee compensation, direct materials, manufacturing overhead & other increased to \$18,014,919 (2020 - \$6,034,558), primarily due to the increased amount of contract values in the Company and in the Pyro Green-Gas subsidiaries. Of note, the Company in 2020 applied for an amount of \$775,967 in wage subsidy from the Government of Canada under the CEWS "Canada Emergency Wage Subsidy" program. From this amount, \$118,416 was applied to employee compensation under cost of sales and services. Subcontracting and foreign exchange charge on materials decreased to \$304,402 (2020 - \$1,429,033).

The gross margin for 2021 was \$12,431,811 or 40% of revenue compared to a gross margin of \$10,302,668 or 58% of revenue for 2020. 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 2021 and 2020 are in line with management's expectations.

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 increased to \$148,695 in 2021, compared to \$18,420 in 2020. The increase is primarily related to more contracts being eligible for qualifying tax credits.

The amortization of intangible assets of \$465,913 in 2021 compared to \$27,190 for 2020 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.



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**Selling, General and Administrative Expenses**

	Three months ended Dec 31			Twelve months ended Dec 31		
	2021	2020	% Change 2021vs2020	2021	2020	% Change 2021vs2020
Employee compensation	\$ 4,648,952	\$ 2,330,825	99%	\$ 8,664,603	\$ 5,647,759	53%
Professional fees	998,098	278,730	258%	3,884,734	1,303,248	198%
Office and general	125,224	104,720	20%	609,353	354,453	72%
Travel	37,193	27,669	34%	114,206	103,295	11%
Depreciation of property and equipment	102,024	23,880	327%	356,103	63,118	464%
Depreciation of ROU assets	166,223	101,794	63%	570,411	408,335	40%
Investment tax credits	(9,007)	17,105	153%	(32,486)	(30,000)	8%
Government grants	(32,612)	(7,500)	335%	(76,845)	(54,228)	42%
Other expenses	1,035,375	71,266	1,353%	3,384,311	293,965	1,051%
<b>Sub-total not including share-based expenses</b>	<b>\$ 7,071,470</b>	<b>\$ 2,948,488</b>	<b>140%</b>	<b>\$ 17,474,390</b>	<b>\$ 8,089,945</b>	<b>116%</b>
Share-based expenses	4,878,526	1,132,696	331%	9,762,745	4,244,608	130%
<b>Total selling, general and administrative</b>	<b>\$ 11,949,996</b>	<b>\$ 4,081,184</b>	<b>193%</b>	<b>\$ 27,237,135</b>	<b>\$ 12,334,553</b>	<b>121%</b>

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 2021 excluding the costs associated with share-based compensation (a non-cash item in which the option expense is amortized over the vesting period) were \$17,474,390 representing an increase of 116% compared to \$8,089,945 reported for 2020.

The SG&A expenses, which now include those of Pyro Green-Gas since the acquisition date, increased in 2021 over the same period in 2020 and the net effect is as follows:

- i) an increase of 53% in employee compensation primarily due to additional head count, an increased in commissions and bonuses,
- ii) an increase of 198% 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 72% in office and general expenses, is primarily due to computer, and information technology expenses,
- iv) travel costs increased by 11%, due to an increase in travel abroad,
- v) depreciation on property and equipment increased by 464% due to higher amounts of property and equipment being depreciated,
- vi) depreciation on right of use assets increased by 40% due to higher amounts of right of use assets being depreciated,
- vii) investment tax credits increased by 8% to 32,486,
- viii) government grants increased by 42%, due to higher levels of activities supported by such grants,
- ix) other expenses increased by 1,051%, primarily due to an increase in, D&O insurance expense.

Separately, share-based payments increased by \$5,518,137 in 2021 over the same period in 2020 as a result of the stock options granted 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.

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**Depreciation on Property and Equipment**

	Three months ended Dec 31			Twelve months ended Dec 31		
	2021	2020	% Change 2021vs2020	2021	2020	% Change 2021vs2020
Depreciation of property and equipment	\$ 102,024	\$ 23,880	327%	\$ 356,103	\$ 63,118	464%

The depreciation on property and equipment increased to \$356,103 in 2021, compared to \$63,118 in 2020. The 464% increase is due to higher amounts of property and equipment being depreciated.

**Research and Development ("R&D") Expenses**

	Three months ended Dec 31			Twelve months ended Dec 31		
	2021	2020	% Change 2021vs2020	2021	2020	% Change 2021vs2020
Employee compensation	\$ 186,677	\$ 107,130	74%	\$ 777,870	\$ 529,309	47%
Investment tax credits	757,946	(1,094,256)	-169%	684,709	(1,141,468)	-160%
Subcontracting	14,356	10,187	41%	135,066	35,578	280%
Materials and equipment	136,982	64,530	112%	912,456	176,436	417%
Other expenses	68,956	29,335	135%	175,461	34,501	409%
<b>Sub-total before government grants</b>	<b>\$ 1,164,917</b>	<b>\$ (883,074)</b>	<b>232%</b>	<b>\$ 2,685,562</b>	<b>\$ (365,644)</b>	<b>834%</b>
Government grants	(16,115)	821	2063%	(149,575)	(365,433)	-59%
<b>Total net R&amp;D expenses</b>	<b>\$ 1,148,802</b>	<b>\$ (882,252)</b>	<b>230%</b>	<b>\$ 2,535,987</b>	<b>\$ (731,077)</b>	<b>447%</b>

The Company incurred \$2,535,987 of R&D expenses, net of government grants, on internal projects in 2021, an increase of 447% compared to (\$731,077) in 2020. The increase in 2021 is due to an increase in R&D activities, the type of contracts being executed, the nature of the project activity, and an increase in employee compensation, subcontracting, materials and equipment and other expenses of \$2,000,853 compared to \$775,824 and a decrease in investment tax credits of 684,709 compared to (1,141,468) reported in 2020.

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			Twelve months ended Dec 31		
	2021	2020	% Change 2021vs2020	2021	2020	% Change 2021vs2020
Interest on convertible debentures	\$ -	\$ -	0%	\$ -	\$ 171,042	-100%
Interest accretion of convertible debentures	-	-	0%	-	182,700	-100%
Interest on term loans	87,422	(67,242)	230%	99,960	20,957	377%
Interest on lease liabilities	86,177	46,581	85%	307,691	211,666	45%
Interest accretion on promissory notes	-	-	0%	-	17,937	-100%
Interest on long term debts	110,203	-	100%	110,203	-	100%
Accretion of royalty receivable	16,283	-	100%	(132,808)	-	-100%
Other interest expenses	4,320	51,439	-92%	19,324	57,550	-66%
Capitalized finance costs on borrowing costs	-	-	0%	-	(137,778)	-100%
<b>Financial expenses</b>	<b>\$ 304,405</b>	<b>\$ 30,778</b>	<b>889%</b>	<b>\$ 404,370</b>	<b>\$ 524,074</b>	<b>-23%</b>

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Finance expenses for 2021 totaled \$404,370 as compared with \$524,074 for 2020, representing a decrease of 23% year-over-year. The decrease in finance costs, is primarily attributable to the extinguishment of term loans, other loans, and convertible debentures in 2020.

**Strategic Investments**

	Three months ended Dec 31			Twelve months ended Dec 31		
	2021	2020	% Change 2021vs2020	2021	2020	% Change 2021vs2020
Changes to fair value of strategic investments	\$ (11,045,508)	\$ 23,998,400	-146%	\$ (21,426,218)	\$ 44,626,698	-148%

The adjustment to the fair market value of strategic investments in 2021 resulted in a loss of \$21,426,218 compared to a gain in the amount of \$44,626,698 in 2020, representing a decrease of \$66,052,916. The decrease is primarily attributable to the decreased market share value of common shares and warrants owned by the Company of HPQ Silicon Resources Inc.

**Comprehensive (loss) Income**

	Three months ended Dec 31			Twelve months ended Dec 31		
	2021	2020	% Change 2021vs2020	2021	2020	% Change 2021vs2020
Comprehensive (loss) income	\$ (22,402,857)	\$ 22,971,415	-198%	\$ (38,428,495)	\$ 41,768,404	-192%

The comprehensive loss for 2021 of \$38,428,495 compared to an income of \$41,768,404, in 2020, represents a decrease of 192% year-over-year. The variation of \$80,196,899 in the comprehensive income (loss) in 2021 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) an increase in product and service-related revenue of \$13,293,321 arising in 2021,
- (ii) an increase in cost of sales and services of \$11,164,178, primarily due to an increase in employee compensation, direct materials, manufacturing overhead & other, and amortization of intangible assets,
- (iii) an increase in SG&A expenses not including share-based expenses of \$9,384,445 arising in 2021 primarily due to an increase in employee compensations, professional fees, office & general, travel, depreciation of property and equipment, depreciation of ROU assets and other expenses,
- (iv) an increase in R&D expenses of \$3,267,064 primarily related to the increase in employee compensation, subcontracting, materials and equipment, and other expenses and a decrease in investment tax credits, recognition of investment tax credits in 2020 and prior years in the amount of \$1,141,468 which include amounts that reduce Canadian income taxes payable in 2020 and an amount of \$365,433 in government grants,
- (v) an increase in share-based expense of \$5,518,137,
- (vi) a decrease in changes in fair market value of strategic investments and net finance costs of \$65,933,212,
- (vii) a decrease in income taxes of \$1,773,372.

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

	Three months ended Dec 31			Twelve months ended Dec 31		
	2021	2020	% Change 2021vs2020	2021	2020	% Change 2021vs2020
Comprehensive income (loss)	\$ (22,402,857)	\$ 22,971,415	-198%	\$ (38,428,495)	\$ 41,768,404	-192%
Depreciation of property and equipment	102,024	23,880	327%	356,103	63,118	464%
Depreciation of ROU assets	166,223	101,794	63%	570,411	408,335	40%
Amortization of intangible assets	353,333	6,782	5110%	465,913	27,190	1614%
Financial expenses	74,326	30,778	141%	404,370	\$ 524,074	-23%
Income taxes	(739,960)	1,033,412	-172%	(739,960)	1,033,412	-172%
<b>EBITDA</b>	<b>\$ (22,446,911)</b>	<b>\$ 24,168,061</b>	<b>-193%</b>	<b>\$ (37,371,658)</b>	<b>\$ 43,824,533</b>	<b>-185%</b>
Other non-cash items:						
Share-based expenses	4,878,526	1,132,696	331%	9,762,745	4,244,608	130%
<b>Adjusted EBITDA</b>	<b>\$ (17,568,385)</b>	<b>\$ 25,300,757</b>	<b>-169%</b>	<b>\$ (27,608,913)</b>	<b>48,069,141</b>	<b>-157%</b>
Change in fair value of investments	11,045,508	(23,998,400)	146%	21,426,218	(44,626,698)	148%
<b>Modified EBITDA <sup>(1)</sup></b>	<b>\$ (6,522,877)</b>	<b>\$ 1,302,357</b>	<b>-601%</b>	<b>\$ (6,182,695)</b>	<b>\$ 3,442,443</b>	<b>-280%</b>

<sup>1</sup> See "Non-IFRS Measures"

The EBITDA in 2021 was a \$37,371,658 loss compared to an EBITDA gain of \$43,824,533 for 2020, representing a decrease of 185% year-over-year. The decrease in the EBITDA in 2021 compared to 2020 is due to the decrease in net earnings and comprehensive income of \$80,196,899, offset by an increase in depreciation on property and equipment of \$292,985, an increase in depreciation on right-of-use assets of \$162,076, an increase in amortization of intangible assets of \$438,723, a decrease in finance charges of \$119,704 and a decrease in income taxes of \$1,773,372.

Adjusted EBITDA in 2021 was a \$27,608,913 loss compared to an Adjusted EBITDA gain of \$48,069,141 for 2020. The decrease of \$75,678,054 in the Adjusted EBITDA in 2021 is attributable to a decrease in EBITDA of \$81,196,191, and an increase of \$5,518,137 in share-based payments.

The Modified EBITDA in 2021 was a \$6,182,695 loss compared to a Modified EBITDA gain of \$3,442,443 for 2020, representing a decrease of 280%. The decrease in the Modified EBITDA loss in 2021 is attributable to the decrease as mentioned above in the Adjusted EBITDA loss of \$75,678,054 and an increase in change of fair value of investments of \$66,052,916.

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**SUMMARY OF QUARTERLY RESULTS**

	2021				2020			
	Q4	Q3	Q2	Q1	Q4	Q3	Q2	Q1
Revenues	\$ 7,205,349	\$ 9,317,926	\$ 8,280,572	\$ 6,264,503	\$ 6,778,240	\$ 8,149,427	\$ 2,128,454	\$ 718,908
Gross margin	1,302,789	4,052,531	4,933,481	2,143,010	3,236,136	5,532,526	1,266,592	267,414
Gross margin %	18.1%	43.5%	59.6%	34.2%	47.7%	67.9%	59.5%	37.2%
Net income (loss) and comprehensive income (loss)	(22,402,857)	623,664	(20,362,205)	3,712,903	22,971,415	15,325,996	5,228,020	(1,757,027)
Earnings (loss) per share								
Basic	(0.13)	0.00	(0.12)	0.02	0.15	0.10	0.04	(0.01)
Diluted	(0.13)	0.00	(0.11)	0.02	0.15	0.09	0.03	(0.01)

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 2021 include revenues from the sale of intellectual property and royalties of \$3,300,000 and \$315,845, respectively.

**LIQUIDITY AND CAPITAL RESOURCES**

As at December 31, 2021, the Company has cash and cash equivalents of \$12,202,513. In addition, the accounts payable and accrued liabilities of \$10,069,177 are payable within 12 months. The Company expects that its cash position will be able to finance its operations for the foreseeable future.

	Carrying Value	Total contractual amount	Less than 1 year	2-3 years	4-5 years	Over 5 years
	\$	\$	\$	\$	\$	\$
Accounts payable and accrued liabilities	10,069,177	10,069,177	10,069,177	-	-	-
Term loans	190,905	263,232	85,731	67,561	62,823	47,117
Balance due on business combination	3,952,203	4,355,600	2,395,580	1,960,020	-	-
Lease liabilities	5,323,965	6,614,192	3,220,750	710,493	561,628	2,121,321
	19,536,250	21,302,201	15,771,238	2,738,074	624,451	2,168,438

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**SUMMARY OF CASH FLOWS**

	Three months ended Dec 31		Twelve months ended Dec 31	
	2021	2020	2021	2020
Cash provided by (used in) operating activities	\$ (1,763,488)	\$ (2,452,405)	\$ (18,113,432)	\$ (814,987)
Cash provided by (used in) investing activities	1,299,358	6,555,839	2,722,957	4,931,532
Cash provided by (used in) financing activities	(3,128,952)	11,936,551	9,474,022	13,984,628
Effect of exchange rate changes on cash denominated in foreign currency	14,067	(30,705)	14,067	(30,705)
Increase (decrease) in cash	(3,579,015)	16,009,280	(5,902,386)	18,070,468
Cash - end of period	12,202,513	10,104,899	12,202,513	10,104,899

On a year-to-date basis, cash flow used by operating activities was \$18,113,432 compared to \$814,987 for the same period in the prior year.

The use of cash during 2021 consists of the net loss of \$38,431,939 (2020 – net earnings of \$41,768,404) plus adjustments for operating activities of \$32,904,463 (2020 - \$38,458,583), including a net change in non-cash operating working capital items of \$12,585,956 (2020 – net change of \$4,124,808).

Investing activities resulted in a net source of funds of \$2,722,957 in 2021, compared to a net source of funds of \$4,931,532 in 2020 resulting from the additions to property and equipment, intangible assets, purchased and disposals of strategic investments and cash acquired through the business combination.

Financing activities in 2021 resulted in a net source of funds of \$9,474,022, compared with a net source of funds of \$13,984,628 for the same period in 2020. In 2021, the Company issued common shares for net cash proceeds of \$14,195,015, repaid an amount of \$283,585 in loans and lease liabilities, and repurchase 840,094 common shares for an amount of \$4,183,617. In 2020, the Company issued common shares for net cash proceeds of \$16,819,050, received \$1,098,919 from the issuance of loans, and repaid loans and lease liabilities in the amount of \$2,573,937 and repurchased 1,285,000 common shares for an amount of \$964,391. Financing activities also include interest paid of \$253,791 in 2021 compared to \$395,013 in 2020.

The net cash position of the Company decreased by \$5,902,386 for 2021 compared to an increase of \$18,070,468 for 2020.

**CAPITAL STOCK INFORMATION**

The authorized share capital of the Company consists of an unlimited number of common shares. As at March 31, 2022 PyroGenesis had 170,125,795 Common Shares, 8,843,000 outstanding stock options issued, and 7,123,000 exercisable options issued.

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**GOING CONCERN**

The Company presumes it will be able to realize its assets and discharge its liabilities in the normal course of business for the foreseeable future. The Company's management has reviewed the Company's projected cash flow and backlog and is of the opinion that the Company has sufficient cash and cash equivalents and will generate cash flow inflow and profits from operations and strategic investments to meet current and future cash requirements. Management expects that the investments currently being made in accelerating projects under development for various clients, together with executing on its \$47.7MM backlog at March 31, 2022 which is primarily related to the Company's successful diversification into niche markets of the additive manufacturing (including 3D printing), and metals & mining industries, and projects related to biogas upgrading, will continue to improve the Company's cash position.

The 2021 consolidated Financial Statements have been prepared using IFRS as issued by the IASB applicable to a going concern, which contemplates the realization of assets and settlement of liabilities in the normal course of business as they become due. If the going concern assumption were not appropriate for these consolidated financial statements, then adjustments would be necessary to the carrying value of assets and liabilities, the reported expenses and the statements of financial position classifications used. The impact on the consolidated financial statements could be material.

**RELATED PARTY TRANSACTIONS**

During the year ended December 31, 2021 and 2020, the Company concluded the following transactions with related parties:

In 2021, rent and property taxes were charged by a trust whose beneficiary is the controlling shareholder and CEO of the Company in the amount of \$274,934 (2020 - \$274,106). As of January 1, 2020, a lease for rental of a property with a trust whose beneficiary is the controlling shareholder and CEO of the Company was modified and extended for five years. At the date of modification, the lease liability was using a discounted rate of 4% and an amount of \$366,566 was recorded as an adjustment to the right-of-use asset. The modified agreement included a requirement to prepay rent of \$1,178,529 and municipal tax of \$260,000. In return for the modification of the lease agreement, a 2020 convertible loan of \$903,000 from a trust whose beneficiary is the controlling shareholder and CEO of the Company, was converted into 3,225,000 common shares of the Company. These expenses are recorded in captions cost of sales and selling and general in the statement of comprehensive income (loss). As at December 31, 2021 the right-of-use asset and the lease liabilities amount to \$1,107,131 and \$Nil respectively (2020 - \$1,328,557 and \$221,496).

An amount of \$Nil (December 31, 2020 - \$58,050), of interest payable was accrued on the 2020 convertible loan of \$903,000 from a trust whose beneficiary is the controlling shareholder and CEO of the Company.

A balance due to the controlling shareholder and CEO of the Company amounted to \$144,506 (2020 - \$72,188) is included in accounts payable and accrued liabilities.

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An amount of \$Nil (2020 - \$17,937), of interest accretion was expensed in net financing costs on the loan of \$295,000 from the controlling shareholder and CEO of the Company.

The key management personnel is comprised of all members of the Board of Directors and certain Officers of the Company. Total compensation to key management consisted of the following:

	2021	2020
	\$	\$
Salaries – key management	3,049,501	2,148,420
Pension contributions	59,377	18,529
Fees – Board of Directors	187,600	150,000
Share-based compensation – officers	6,182,573	1,989,144
Share-based compensation – Board of Directors	2,338,650	846,410
Other benefits – officers	237,903	544,402
<b>Total compensation</b>	<b>12,055,604</b>	<b>5,696,905</b>

**CORPORATE HIGHLIGHTS**

On January 12, 2021, the Company announced the intention to implement a Normal Course Issuer Bid ("NCIB"), whereby it may purchase, from time to time, over a period of 12 months starting January 14, 2021, up to 5,000,000 common shares.

On March 10, 2021, the Company announced that the Company's application to list its common shares on the NASDAQ had been approved. Trading commenced on March 11, 2021, under the ticker symbol "PYR".

On March 15, 2021, the Company announced that it had elected to exercise its right under the common share purchase warrant indenture dated November 10, 2020, between the Company and AST Trust Company, to accelerate the expiry date of the common share purchase warrants of the Company issued under the Warrant Indenture. The warrants were issued on November 10, 2021, in connection with the bought-deal short form prospectus offering of units of the Company, of which each unit was comprised of one common share of the Company and one-half of one warrant. The warrants new expiry date was moved to April 14, 2021.

On March 17, 2021, the Company announced that it had received a grant of \$194,090 from the Ministry of the Economy and Innovation, through the Support for innovation projects component of the Innovation program, administered by Investissement Québec. The goal of the project is to develop a solution to recover the residues of pot lining, which are produced in the primary aluminum industry, and which are considered dangerous. PyroGenesis will play an important role in eliminating the landfill of this material and potentially other industrial by-products, in addition to significantly reducing specific greenhouse gas emissions.

On April 1, 2021, the Company announced it had appointed DGWA, the German Institute for Asset and Equity Allocation and Valuation ("Deutsche Gesellschaft für Wertpapieranalyse GmbH", "DGWA"), a German investment banking boutique, as its Investor and Corporate Relations advisor in Europe, effective April 1st, 2021, for a period of twelve months.



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On April 19, 2021, the Company announced that its cutting-edge Additive Manufacturing (“AM”) NexGen™ Powder production line, incorporating all the improvements previously announced (increased production rate, lower CAPEX, lower OPEX, narrower particle size distribution) was put in place and producing powders. PyroGenesis’ game-changing NexGen™ Plasma Atomization System, with its production rate exceeding 25k g/h, has shattered all published plasma-atomized production rates for titanium known to management.

On April 20, 2021, the Company announced the signing of a qualification agreement with a premier global aerospace company to produce metal powders. Under this agreement, the customer will perform a standard qualification process typically required before a company can become an approved supplier. The process will, amongst other things, evaluate the Company’s manufacturing methods, test samples of powder for batch-to-batch consistency and determine mechanical and chemical properties.

On April 27, 2021, the Company announced that it had signed a binding Letter of Intent (“LOI”), which outlines the terms and conditions pursuant to which PyroGenesis would acquire AirScience Technologies Inc (“AST”) for an initial purchase price of \$4.8MM. AST is a Montreal-based company that designs and builds (i) gas upgrading systems (specifically from biogas to renewable natural gas, or “RNG”), (ii) Pyrolysis-Gas Purification, (iii) Coke-Oven Gas (“COG”) Purification as well as providing (iv) Biogas & Landfill-Gas Flares and Thermal Oxidizers.

On May 12, 2021, the Company announced that further to its press release dated April 19, 2021, powder test runs for batch-to-batch consistency using its cutting-edge Additive Manufacturing (“AM”) NexGen™ powder production line had been completed successfully, and ahead of schedule. The Company is now producing AM metal powders for clients.

On May 13, 2021, the Company announced that further to its press release dated March 3, 2021 (wherein it was disclosed that PyroGenesis almost doubled its manufacturing footprint by leasing an additional 31,632 sq. ft), the Company announced the successful installation of approximately \$1MM in state-of-the-art plasma torch production equipment in its new facility located in Montreal, Quebec, Canada.

On May 26, 2021, the Company announced, that further to its Press Release dated May 12, 2021, the Company had shipped its first commercial samples of plasma-atomized titanium powder to a client in the aerospace industry (to remain confidential for competitive reasons).

On May 27, 2021, the Company announced that is had received a \$700,000 grant from Sustainable Development Technology Canada for a novel production process to transform quartz into fumed silica using a plasma reactor, thereby reducing hazardous waste and greenhouse gas emissions in comparison to the established fumed silica production process. This project is in partnership with HPQ Silicon Resources, a provider of innovative, cost-effective and low carbon emission silicon-based solutions.

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On June 7, 2021, the Company announced that it had received a Letter of Intent (LOI) from an existing client, to purchase three 10-ton DROSRITE™ systems. The contract, if finalized, is expected to be in the range of \$10-15MM.

On July 6, 2021, the Company announced that, further to its press release dated May 27, 2021, wherein it had announced a \$700,000 grant from Sustainable Development Technology Canada to develop a novel production process to transform quartz into fumed silica, PyroGenesis had signed a contract for approx. \$4MM with HPQ Silica Polvere Inc., a wholly owned subsidiary of HPQ Silicon Resources Inc. This contract is part of a project, valued for a total of approx. \$5.3MM. The difference is expected to be funded by an additional government agency for \$630,000 as well as a contribution by PyroGenesis of \$175,000. It is expected that all these amounts will be paid directly to PyroGenesis.

On August 5, 2021, the Company announced that further to HPQ Silicon Resources Inc's press release on August 5, 2021, the Company had successfully produced Nano Silicon materials with its PUREVAP™ Nano Silicon Reactor for HPQ Nano Silicon Powders Inc, a wholly owned subsidiary of HPQ Silicon Resources Inc.

On August 12, 2021, the Company announced that, further to its press release dated April 27, 2021, it had finalized its strategic acquisition of AirScience Technologies Inc. and its subsidiaries for an amended total cash consideration of approx. \$4.4MM payable in instalments upon successful completion of five predetermined milestones. In September 2021, AirScience Technologies Inc. was renamed to Pyro Green-Gas Inc.

On August 17, 2021, the Company announced that it had signed a \$1.2MM contract for two Air Plasma Torch systems with an existing Asian client. These torches are to be incorporated into the client's medical waste destruction systems.

On September 8, 2021, the Company announced that further to its press releases dated May 27 and July 6, 2021, it had received \$630,000 in additional funding from a second government agency for a total project value of approximately \$5.3MM (including sale of IP of \$3.3MM), all to be received by the Company.

On September 14, 2021, the Company announced that it had received an order to supply four (4) high powered plasma torches together with ancillary equipment to a client for approximately \$6MM. This does not include continued after-sale services, which would be part of a separate services agreement. The client is a multi-billion-dollar international producer of iron ore, whose name will remain confidential for competitive reasons. The client's objective is to reduce greenhouse gases by replacing their fossil fuel burners with PyroGenesis' proprietary plasma torches. The client advised PyroGenesis that, upon the successful implementation of the torches, the subsequent orders are expected to be for approximately 130 plasma torches. Notwithstanding this, there is no guarantee that such orders will be placed. The schedule to implement these future orders remains to be determined.

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On September 20, 2021, the company announced that it had been added to the FTSA Global Total Cap Index and FTSE Global Micro Cap Index, following the semi-annual reconstitution, which took effect on September 20, 2021.

On September 22, 2021, the Company announced that its subsidiary, Pyro Green-Gas, had been selected to supply its landfill biogas purification system to Carbonaxion Bioénergies Inc., the promoter of GNR Neuville project, which is being developed at the environmental complex of the Régie régionale de gestion des matières résiduelles de Portneuf, located in Quebec, Canada. The Régie is a municipal organization that manages the residual materials of 24 municipalities.

On September 27, 2021, the Company announced that it had signed a joint venture and license agreements (both agreements collectively the "JV") with a leading residue processor to transform dross residues into high value chemical products. The 50:50 JV will be geared towards building, installing and operating dross residue valorization facilities worldwide. To this effect, PyroGenesis secured, through the JV, an exclusive license to a patented and novel technology which is expected to convert dross residues into high value chemical products. Under the terms of the JV, the exclusive access to the technology initially applies to projects in North America and in the Gulf Cooperation Council nations. Upon successful completion of the first project, the exclusive access to the technology will expand to include, for all sense and purposes, most of the world. These dross residues are currently either being (i) landfilled (which is increasingly becoming banned by regulators) or (ii) sold as cheap flux to the cement industry.

On October 18, 2021, the Company announced that its subsidiary, Pyro Green-Gas had received a milestone payment of approximately \$2.5MM under an existing \$9.3MM contract with Tata Steel, one of the world's top diversified steel producers with commercial operations worldwide. In addition to the payment, Pyro Green Gas had signed an additional contract for \$267,000 with Tata Steel. Pyro Green-Gas will provide supplementary engineering improvements to the dry coke oven gas desulfurization and hydrogen production process already under contract. Pyro Green-Gas will supply filters that will further purify the remaining gas, removing condensed hydrocarbons, naphthalene and dust from the coke oven gas infrastructure. This will allow the purified gas to be used as a fuel for galvanizing and annealing furnaces in steel processing.

On October 19, 2021, the Company announced that it had been awarded an Innovative Solutions Canada (ISC) Phase 2 (Prototype Development contract of approximately \$1.5MM to develop a unique ceramic powder (HCP) processing system for the National Research Council Canada, Canada's largest federal research and development organization.

On October 28, 2021, the Company announced that it has been selected to provide a \$9.2MM land-based system to destroy Perfluoroalkyl and Polyfluoroalkyl Substances. The client is a large operator of public water systems.

#### **SUBSEQUENT EVENTS**

On February 2, 2022, the Company announced that it had entered into an agreement with an existing client, to purchase the first of three 10,000 TPY ("10-Ton") Drosrite™ systems. The contract

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is for US \$3MM (approximately \$4MM CAD). The execution of this contract follows the receipt of a letter of intent from the existing client on June 7, 2021, in which the client expressed its intention to purchase three 10-ton systems to address an increase in their overall dross processing capacity.

The client is expanding its aluminum processing facilities and, as such, expects to process an additional 30,000 tons/year of dross.

On February 7, 2022, the Company announced it had signed a \$273,000 (€189,000) plasma torch contract with a European research center. The contract is for PyroGenesis to manufacture and deliver a 50-kW methane plasma torch, which will be used by the customer to develop a process to convert hydrocarbons, including methane (a GHG), into useful chemicals such as olefins (e.g., ethylene, propylene), thereby significantly reducing GHGs.

On February 11, 2022, the Company announced the acceptance from the TSX of its Notice of Intention to implement a NCIB. Pursuant to the NCIB, PyroGenesis may purchase, from time to time, over a period of 12 months starting February 15, 2022, up to 7,500,000 common shares.

#### **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 3, 4 and 28 of the 2021 consolidated Financial Statements.

#### **CONTROLS AND PROCEDURES**

In the years prior to, and most of 2020, the Company's shares traded on the TSX Venture Exchange ("TSXV"), and all requirements of the TSXV were attained by the Company. The Company graduated from the TSXV to the Toronto Stock Exchange ("TSX") on November 20, 2020, and subsequently became listed on the NASDAQ on March 11, 2021. It was recognized by the Company that being listed on the TSX, and NASDAQ would require more stringent disclosure controls, and started implementing such before the NASDAQ listing.

When listed on the TSXV, management was not required to assess disclosure controls and procedures ("DC&P") and internal control over financial reporting ("ICFR"). 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 DC&P and ICFR, as defined in NI 52-109 and the applicable rules of the U.S. Securities and Exchange Commission. Such requirements also include the evaluation of both DC&P and ICFR. Consequently, the Company took and continues to take a number of actions to improve its DC&P and ICFR. 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

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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, 2021, an evaluation was carried out under the supervision of the CEO and CFO, of the design and operating effectiveness of the Company's disclosure controls and procedures. 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, 2021.

#### **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, 2021, 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, 2021. 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 control deficiencies were considered to be material weaknesses:

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- **Control environment:** The Company did not maintain an effective control environment and has identified deficiencies relating to: (i) appropriate organizational structure, reporting lines, and authority and responsibilities, including our Board of Directors' and Audit Committee's oversight and governance of external financial reporting and related party transactions, (ii) lack of senior financial reporting resources for a portion of the year, to deal with complex accounting matters and perform management review controls over period-end consolidated financial statements. 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 (iii) holding individuals accountable for their internal control related responsibilities.
- **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. For example, control activities related to documentation and consistency in accounting for intangible assets internally generated and revenue recognition were deficient.
- **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.
- **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
- **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. Management did not perform appropriate user access reviews, including superuser access.

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. The Company's subsidiaries from the Pyro Green-Gas Inc. acquisition were excluded from the evaluation of DC&P and ICFR given that the acquisition occurred during the year and their assets and revenues represent approximately 12% and 22% respectively, of the consolidated amounts.

Aside from these material weaknesses, management has concluded that the Company's consolidated financial statements as at and for the year ended December 31, 2021, present fairly,

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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, 2021, 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, 2021, the Company's design and operation of ICFR and DC&P were not effective.

#### **Management's Remediation Measures**

During the year ended December 31, 2021, management initiated and continues to implement remediation measures outlined in the 2020 MD&A. 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. 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.

Management, with oversight of the Audit Committee, continue to implement remediation plans for the aforementioned material weaknesses in ICFR and DC&P as follows:

- Continue to establish and improve an appropriate organizational structure and policies that the Board of Directors and Audit Committee will enforce to ensure proper oversight and governance of the external financial reporting process and related party transactions. Awareness by the Audit Committee and support over financial reporting matters has been improved
- Train, and retain individuals with appropriate skills and experience, assign responsibilities and hold individuals accountable for their roles related to ICFR. During the latter part of 2021, a new CFO was retained with the appropriate skills and knowledge to deal with complex accounting matters and perform management review controls over period-end consolidated financial statements as well as skills and knowledge of ICFR which has contributed to mitigating to a certain extent the severity of this control deficiency.
- Design and implement a risk assessment process to identify and assess risks of material misstatement and ensure that the impacted financial reporting processes and related internal controls are properly designed and in place to respond to those risks in our financial reporting; as a result, additional compensating internal controls were implemented in order to address and mitigate such risks, and
- Enhance the design of existing control activities and implement additional process-level control activities (including controls over the order-to-cash, procure-to-pay, hire-to-pay, long-lived assets, inventory, significant unusual transactions, related party transactions and other financial reporting processes) and ensure they are properly evidenced and operating effectively. A firm has been engaged to assist in the selection and testing of key internal controls and validate their effectiveness.

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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, 2021 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 disclosure controls and procedures and internal control over financial reporting, no matter how well designed and operated, can provide only reasonable assurance of achieving their objectives. Because of their inherent limitations, disclosure controls and procedures and internal control over financial reporting 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 2021 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](http://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



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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, 2021, the Company had a history of losses and negative cash flows. For the year ended December 31, 2021, the Company has net losses of \$38,431,939, cash flows used in operations of \$18,113,432, and an accumulated deficit of \$61,217,831 at December 31, 2021. 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;

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- (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***

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, 2021, sales of PyroGenesis to its four principal customers accounted for approximately 79% of its total revenue. For the year ended December 31, 2020, 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.

#### ***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, 2021, the Company has a net loss of \$38,431,939 which includes a loss from the change in value of strategic investment of \$21,426,218 and cash flows used in operations of \$18,113,432. 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.

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### ***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 31, 2022, 8,843,000 stock options are currently issued and outstanding. 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

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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

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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.

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### ***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 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

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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.

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***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



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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

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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.

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***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, 2021, 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.

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***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, 79,744,498 Common Shares, representing in aggregate 46.87% of the total voting rights attached to the outstanding Common Shares, and options to acquire an additional 5,920,000 Common Shares (increasing the total number of Common Shares held or controlled, directly or indirectly, by him to 85,664,498 Common Shares, or 47.87% of 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 is 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.

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***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 impose covenants and obligations on the Company. 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;

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- (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.

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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 fulfil 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-

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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



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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.

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### **OUTLOOK**

PyroGenesis completed 2021 having achieved many important accomplishments and milestones. Most importantly, we maintained the accelerated business momentum of the past 18 months despite the challenges of the global marketplace due to Covid, and even introduced new markets and opportunities to provide a broader, stronger platform for 2022 and beyond.

### **Overall Strategy**

Building on its strategy to offer technology solutions that provide benefits from greenhouse gas ("GHG") emissions reduction, the Company increased its offerings in this regard through a series of adjustments, such as internal capacity scaling, diversified sales channel targeting, and external vision – resulting in, most notably, the doubling of production staff, contract wins in new sectors, and the acquisition of AirScience Technologies and its subsequent re-launch as Pyro Green-Gas.

While we had previously considered our strategy to be timely, as many governments are stimulating their respective economies by promoting and funding both environmental technologies and infrastructure projects, 2021 proved an even greater affirmation of this approach, as major industries and organizations targeted by the Company not only recommitted to their targets, but in some cases raised them significantly. For instance, in the iron ore and steel-making sector, in October 2021, Rio Tinto unveiled new targets to reduce its scope 1 & 2 emissions by 50 per cent by 2030, more than tripling its previous targets.

<https://www.riotinto.com/news/releases/2021/Rio-Tinto-to-strengthen-performance-decarbonise-and-grow>

As stated, many times, most of PyroGenesis' product lines do not depend on environmental incentives (tax credits GHG certificates, environmental subsidies, etc.) to be economically viable; with the increased commitments by industry to carbon reduction, it is anticipated that the Company's growth drivers will expand, and shareholders will see increased value.

Furthermore, the experience gained over the past two years as we, and our prospective clients, manoeuvred through both the lengthy modelling and business-case development processes, and the government incentive and procurement system, has provided immeasurable insights into various bureaucratic and government processes – affording a much clearer understanding of the process, enhancing our ability to respond to future situations, and giving us better vision and a rebalance of expectations regarding timeline control. This knowledge will only serve to enhance what management has defined as government incentive-related tailwinds into an already strong pipeline, all with a positive impact on revenues and shareholder value.

The Company is not immune to the negative impact that COVID-19 and other external factors brought on businesses, specifically related to the workforce and, more importantly, the supply chain. However, Management believes that the Company is better situated than most, and through various mitigation measures these challenges continue to be dealt with in an effective manner. The Company expects even greater improvements as the impact of COVID-19 and other external factors continues to recede after Q2 2022.

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### **Organic Growth**

Organic growth will be spurred on by (i) the natural growth of our existing offerings, which continue to be accelerated given our strong balance sheet (ii) leveraging off our “Golden Ticket” advantage that allows us to see first-hand some of the additional and peripheral needs of our customers, and (iii) exploring new ways scientifically (and corresponding markets laterally) to provide unique solutions and value that helps industries deal with some of the most pressing environmental, engineering, and energy problems.

We have described in the past our Golden Ticket advantage as one which occurs when one sells directly, or is engaged directly, with the end user and, as a result, is regularly on-site in the customer's operations – “inside the fence”. A Golden Ticket provides the opportunity to either, (i) cross sell other products or, ideally, (ii) identify new areas of concern that can be addressed uniquely by PyroGenesis.

Over the past several years, PyroGenesis has successfully positioned each of its business lines for rapid growth by strategically partnering with multi-billion-dollar entities. These entities have identified PyroGenesis' offerings to be unique, in demand, and of such a commercial nature as to warrant such unique relationships. We expect that these relationships are now positioned to transition into significant revenue streams.

Regarding how new scientific efforts lead to new markets, in 2021 the Company transitioned its knowledge in waste destruction to consider solving some of the challenges related to polyfluoroalkyl (PFAS), the hazardous “forever chemicals” the EPA has defined as an emerging event requiring fast attention. After winning an initial competitive bidding process to provide a \$9.2MM system, the Company sees continued momentum in this area in 2022 and beyond.

### **Aluminum Industry Process Improvement**

Momentum with PyroGenesis' Aluminum Industry strategy and offering continues to not just bear fruit, but to explode in opportunity in several different directions.

In 2021, the Company concluded a joint venture and a license agreement with an existing and proven technology provider. The technology is geared to uniquely handle the residues resulting from the processing of dross in the aluminum industry. We had previously announced our intention to secure this technology and would not only make our traditional DROSRITE™ offering more appealing but could also be offered as a stand-alone product. We believe that valorizing the residues and producing high end products will further define us as the go-to company for all dross related processing. This is a prime example of our “Coffee & Donuts” strategy in play. The joint venture will only relate to the new technology and, as such, PyroGenesis will not have to vet in any assets or IP (specifically not the DROSRITE™ technology).

Overall, the Company is now one of the largest and certainly the fastest growing dross recovery solutions in the world, with 13 large DROSRITE™ systems in use or slated for delivery to markets around the world. The Company also continue to increase the price and the efficiency of its systems, and is pitching several more contracts as of the writing of this document.

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**Steel Industry Process Improvement**

With steelmaking one of the most carbon-emission intensive industries in the world, estimated to be responsible for between 7 to 12 per cent of all global fossil fuel and greenhouse gas emissions, that industry continues to be under intense pressure, including huge financial penalties, to find emission reductions.

This pressure on the steel-making industry allows PyroGenesis to expect demand for its upstream, iron ore pelletization solution to increase significantly, as steel-makers look to all aspects of the production lifecycle for carbon reduction opportunities.

Serious consideration is being given to replacing large numbers of the fossil fuel burners in iron ore pelletization with PyroGenesis' proprietary and patented plasma torches. To date, everything is proceeding as expected. Initial discussions with potential customers have evolved into confirmation stages, computer simulations, business case development, and initial torch orders for in-factory testing with two of the largest steel-making and mining companies in the world. As these torches are tested in live settings over the coming months, the company expects a resulting roll-out program to replace many, if not all, fossil fuel burners with PyroGenesis' plasma torches in the customers' iron ore pelletization furnaces – a technology process for which PyroGenesis, as the patent holder, commands a significant competitive advantage.

PyroGenesis expects that the previously mentioned government initiatives, geared to stimulating their respective economies by promoting and funding environmental technologies and infrastructure projects, will only serve to increase interest in PyroGenesis' plasma torch offerings to other companies in this space. While potential clients seeking government support for large initiatives may draw out the onset of large contracts, the sheer number of potential customers, and the fact that the Company will engage with many of them in different stages at different times, will help to ensure a long, overlapping pipeline of potential projects.

In addition, PyroGenesis is proactively targeting other industries which are experiencing significant pressure to reduce GHGs, and which utilize fossil fuel burners as well, such as the cement, aluminum, and automotive industries.

**Plasma Torches for Emerging / Niche Markets**

Separately, the Company also offers plasma torches to emerging / niche markets where there is a high probability of on-going sales from successful implementation.

One such example is in land-based waste destruction applications, more specifically for medical waste. The Company signed a contract in August 2021 to supply two Air Plasma Torch systems to an existing client to be used in the destruction of such medical waste.

Another example is the previously announced contract with a technology startup to produce a plasma torch ideal for tunneling. PyroGenesis has reason to believe that the real plasma-based tunneling opportunity may lie outside of the scope of the current agreement. As a result, PyroGenesis terminated this arrangement and this project with this client has ended. PyroGenesis

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is evaluating, and intends to pursue, plasma based tunneling opportunities, specifically those identified to be outside of the scope of the current agreement at a later date.

For each new market, the Company will also benefit from providing proprietary spare parts and service, which generates significant recurring revenue, thus complementing the Company's long-term strategy to build a recurring revenue model.

#### **Additive Manufacturing (Metal Powders for 3D Printing)**

With respect to additive manufacturing, we continue to expect to see significant year over year improvements in our 3D metal powders offering as our NexGen™ facility, which incorporates all the previously disclosed benefits (increased production rates and lower capital & operating expenditures), is now officially on-line and operational.

Of note, a major tier-one global aerospace company has already entered into an agreement with the Company to formally qualify its powder, at considerable expense to the global aerospace company, with a view towards having the Company become a supplier.

There are additional major top tier aerospace companies and OEMs, in both Europe and North America, eagerly awaiting powders from this new state-of-the-art production line, and we are currently in the process of supplying sample powders to them for analysis.

The Company expects that such developments will continue and will translate into significant improvements in contributions to revenue by this segment in the mid-long term.

#### **HPQ/PUREVAP™**

With respect to HPQ, the goal is to continue to expand our role as HPQ's technology provider for the game changing family of silicon processes which we are developing exclusively for HPQ and its wholly owned subsidiaries HPQ Nano Silicon Powders Inc. and HPQ Silica Polvere Inc., namely:

- The PUREVAP™ “Quartz Reduction Reactors” (QRR), an innovative process (patent pending), which should permit the one step transformation of lower purity quartz (SiO<sub>2</sub>) than any traditional processes can handle into a silicon (Si) of a higher purity level (2N-4N) that can be produced by any traditional smelter, at reduced costs, energy input, and carbon footprint. The unique capabilities of this process could position HPQ as a leading provider of the specialised silicon material needed to propagate its considerable renewable energy potential; and
- The PUREVAP™ Nano Silicon Reactor (NSiR), which, if successful, could position itself as a new proprietary low-cost process that can transform the silicon (Si) made by the PUREVAP™ QRR into the nano-silicon materials (spherical silicon powders and silicon nanowires) sought after by energy storage, batteries, electric vehicle manufactures and clean hydrogen sectors participants. The aim of the ongoing work is to position HPQ NANO as the first to market with a commercial scale low-cost nanoparticle production system.

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- A new plasma-based process that could convert Silica (Quartz, SiO<sub>2</sub>) into fumed silica (Pyrogenic Silica) in one step. This new process could be a low-cost and environmentally friendly option that combines HPQ Silicon High Purity Quartz initiatives with PyroGenesis' industry leading know-how in the development of commercial plasma processes. It is envisioned that the process will eliminate harmful chemicals presently generated by traditional methods. This new process could revolutionize the manufacturing of fumed silica, while repatriating production back to North America.

Government participation in a \$5.3MM funding of the fumed silica project confirms our expectation that 2021 should be a year in which significant developments occur on all these fronts.

#### **Land Based Units/Environmental**

The Company did not previously aggressively target the Company's land-based/environmental solutions during the period where the Company's other offerings, such as in steel-making and aluminum industry process improvement, were accelerating.

However, during 2021, interest in the Company's capabilities in this arena was renewed. Besides the interest in niche torch applications mentioned above (ex. medical waste), PyroGenesis' plasma-based solutions have generated interest in processing a waste stream that has recently been classified as hazardous. Management believes that, in a current bidding process, its solution is the technology of choice. If successful, this will represent a significant positioning of PyroGenesis plasma-based solutions not only for this specific product line but, when taken in conjunction with the historic success with its offering on US Aircraft carriers, the land based/environmental segment in general.

#### **Growth through Synergistic Mergers and Acquisitions**

As previously disclosed, the Company is conservatively considering synergistic merger and acquisition strategies to augment its growth, and the Company has been very actively involved in pursuing several opportunities to support this strategy. In so doing, the focus has been on private companies exclusively which (i) primarily leverage the Company's Golden Ticket advantage, or (ii) could uniquely benefit from the Company's engineering advantage and/or international relationships.

During 2021, the Company acquired AirScience Technologies Inc. ("AST"), a company with experience in biogas upgrading. PyroGenesis believes that AST's experience in biogas upgrading, combined with PyroGenesis' engineering and multidisciplinary skills, as well as its proven record of meeting the exacting demands of multibillion-dollar companies and the US military, positions the combination well to address the opportunities arising from this growing need to generate renewable natural gas.

The acquisition of AST also provides potential synergies with PyroGenesis' land-based waste destruction offerings which, if successful, will significantly increase their value to the market. AST's technology complements PyroGenesis' existing offerings and further strengthens PyroGenesis' position as an emerging leader in GHG solutions for sustainable long-term growth.

Our objective is to strengthen AST's operations and quality control systems, over the course of the next 12-18 months, while at the same time increasing the backlog of signed contracts and successfully delivering on existing contracts thus positioning AST as a significant and credible player in the marketplace. Once established, we will evaluate our options to accelerate the rollout of these solutions.

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**Additional Opportunities - Plasma Torches:**

Within the Plasma Torch line of business, the Company continues to consider options to leverage its plasma expertise and continue to review torch technologies that could complement existing offerings, leverage off their unique relationships, or explore new opportunities. In early stage discussion across many sectors and many potential customers, no additional details are available at this time.

**CONCLUSION**

In conclusion, PyroGenesis sees 2022 as a platform from which decades of exponential growth will stem.

The Company plans to take advantage of its unique position in its main business offerings to accelerate growth, with a particular emphasis on offerings geared to aggressively reducing GHG emissions and the world's carbon footprint, while finding and offering solutions to pressing environmental, engineering, and energy challenges.

**FURTHER INFORMATION**

Additional information relating to Company and its business, including the 2021 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](http://www.sedar.com), EDGAR at [www.sec.gov](http://www.sec.gov) or the Company's website at [www.pyrogenesis.com](http://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.