South Star Mining Corp. (TSXV: STS / OTCQB: STSBF)

Completes PFS / Advancing to Pilot Operations

BUY
Current Price: C$0.055
Fair Value: C$0.53
Implied Upside: 871%
Risk: 5

Sector / Industry: Junior Resource

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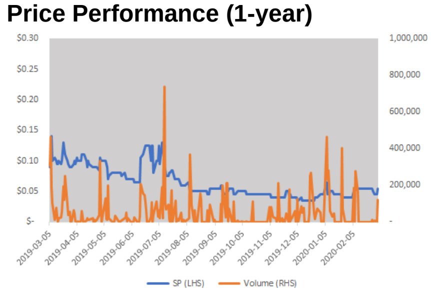
Highlights

- On February 5, 2020, South Star Mining Corp. ("company", "STS") announced results of a Preliminary Feasibility Study ("PFS") on its 100% owned Santa Cruz graphite project located in Southern Bahia, Brazil.
- The PFS showed a base-case After-Tax Net Present Value ("AT-NPV) at 5% of US$81 million, with a high After-Tax Internal Rate of Return ("AT-IRR") of 35%, and a payback period of 4 years.
- Unlike a Preliminary Economic Assessment ("PEA") completed in 2017, the PFS was based on a two-phase open pit operation, allowing the company to advance to production sooner and with a significantly low CAPEX of US$7.3 million.
- The first phase of operation (Phase 1) is contemplated to produce 5,000 tonne per year ("tpy") of 95% Cg concentrate in years 1 and 2.
- A larger phase 2 operation was based on production ramping up to 13,500 tpy of 95% Cg concentrate in year 3, and to 25,000 tpy in years 4 to 11.
- In January 2020, the company submitted trial mining licensing documents. On March 3, 2020, an environmental license was issued for Phase 1.
- The company's immediate focus is to arrange financing to fund the US$7.3 million CAPEX of Phase 1.
- As the graphite market is not expected to be in a deficit until 2025, most graphite juniors are trading at significant discounts to their AT-NPV. On an Enterprise Value to Resource basis, we estimate that the company's shares are trading at $4.4/t versus the comparables' average of $7.5/t.

Price Performance (1-year)



	YTD	12m
Ret.	20.0%	-33.3%
TSXV	-11.2%	-16.2%

Company Data (as of March 5, 2020)

52 Week Range	$0.03 - $0.15
Shares O/S	42,905,430
Market Cap.	$2.36 million
Current Yield	N/A
P/E (forward)	N/A
P/B	0.4x

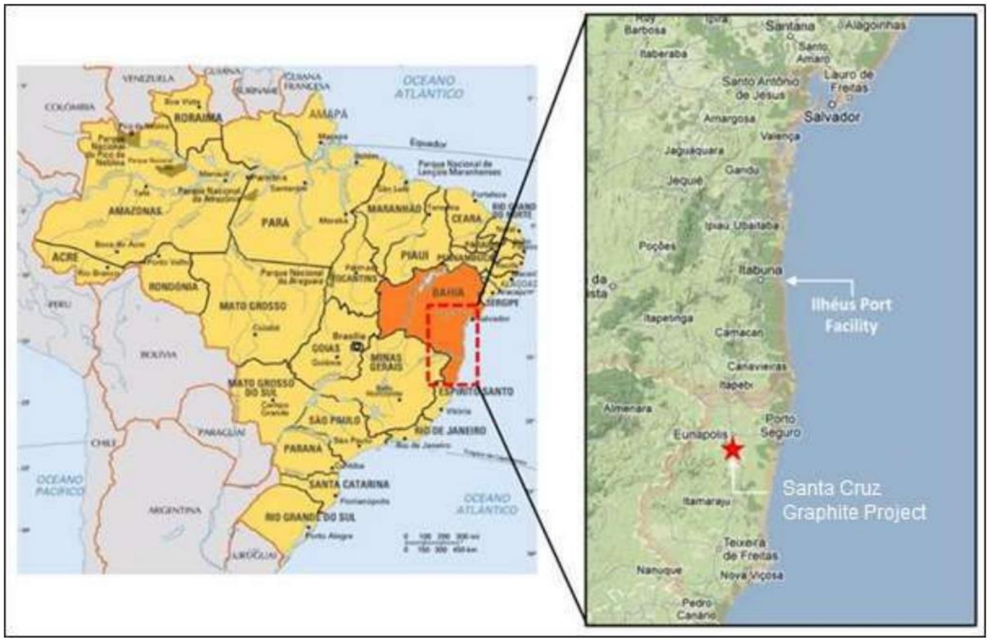
Key Financial Data (FYE - Dec 31) (C$)	2018	2019 (9M)
Cash	$1,275,577	$456,088
Working Capital	$1,435,158	$356,985
Mineral Assets	$5,735,914	$5,735,914
Total Assets	$7,240,312	$6,221,081
Net Income (Loss)	-$2,499,741	-$1,561,762
EPS	-$0.11	-$0.04

*See last page of this report for important disclosures, rating and risk definition. All figures in C$ unless otherwise specified.

Completes PFS

On February 5, 2020, the company announced results of a PFS on its 100%-owned Santa Cruz Graphite project located in Southern Bahia, Brazil.

Project Location



Source: Company

The PFS was based on a two-phase open pit operation:

- **A phase 1 pilot plant** operation including 5,000 tpy of 95% Cg concentrate in years 1 and 2. The objective of this program is to test and optimize flowsheet, develop commercial relationships, and optimize product mix.
- A **larger phase 2 operation**, with production ramping up to 13,500 tpy of 95% Cg concentrate in year 3, and to 25,000 tpy in years 4 to 11.

Maiden Reserve Estimate

The study was based on a maiden reserve estimate of 12 Mt at 2.4% Cg, which is 82.5% of the measured and indicated resource estimate completed in 2019.

2019 Resource	Tonnage	C (%)	In-situ Graphite (t)
Measured	3,947,550	2.40%	94,740
Indicated	10,955,570	2.25%	246,500
M&I	14,903,100	2.29%	341,240
Inferred	7,911,450	2.32%	183,550
2020 Reserve	**Tonnage**	**C (%)**	**In-situ Graphite (t)**
Proved	3,989,635	2.49%	99,340
Probable	8,318,795	2.35%	195,490
Total	**12,308,430**	**2.40%**	**294,830**

Source: Company

The following table compares the PFS to a PEA completed in 2017.

	2017 PEA (US$) - Open Pit	2020 PFS (US$) - Open Pit
Mife Life (years)	19	11
OreTonnage (Mt)	12	12
Average Grade (% Cg)	2.63%	2.40%
Throughput	1,850 tpd / 650,000 tpy	
Annual Production (tonnes) - 95% C	18,900 t in Years 1 - 5/ 15,800 t over remaining life	5,000 tpy in Years 1 & 2, 13,500 tpy in Year 3, and 25,000 tpy in years 4-11
Strip Ratio	1.27	1.60
Recovery	88.0%	
Product Price ($/t)	$1,354	$1,287
Operating Cost ($/t sold)	$316/t in Years 1 - 5 / $413/t LOM	$396/t
Initial CAPEX ($M)	$20.5	$34.5
AT FCF per year	$15.8M in Years 1 - 5 / $10.40M LOM	
AT NPV @ 5% ($M)	$117	$81
AT IRR	78%	35%
AT Payback (years)	2.0	4.0

Source: Company

Low Phase 1 CAPEX

The PFS demonstrates the project's ability to go into production at a significantly lower CAPEX. Phase 1 CAPEX is estimated at US$7.3 million, and phase 2 CAPEX is estimated at $27.2 million, for a total CAPEX of US$34.5 million. Although this is higher than the PEA, the low phase 1 CAPEX will allow the company to advance to production sooner.

The OPEX is estimated at US$604/t in Phase 1 and $386 /t in phase 2, for a LOM averge cost of US$396/t. This is lower than the PEA's estimate of US$413/t.

We note that a key advantage of the Santa Cruz graphite project is its **at / near surface mineralization** (oxidized / hosted within weathered saprolitic material), with significant quantities of large, extra-large, and jumbo graphite flakes. There is no need for crushing or blasting, and the strip ratio is relatively low (life of mine ratio of 1.6, as per the PFS).

The PFS used an average product price of US$1,287/t versus the PEA's US$1,354/t. We are using a long-term forecast of US$1,300/t in our models.

At-NPV of US$81 million versus the current enterprise value of just US$1.8 million

Based on the above inputs, the PFS showed a base-case after-tax NPV at 5% of US$81 million, with **a high after-tax IRR of 35%,** and a payback period of 4 years. These figures are lower than the PEA because of a lower product price, higher CAPEX, and a longer development time for the two-phase approach.

In January 2020, the company submitted trial mining licensing documents to the

National Mining Agency (ANM) for the construction and operation of a 5,000 tpy pilot plant facility. Management expects to receive the license within three to four months. Phase 1 construction is expected to take approximately 8-10 months.

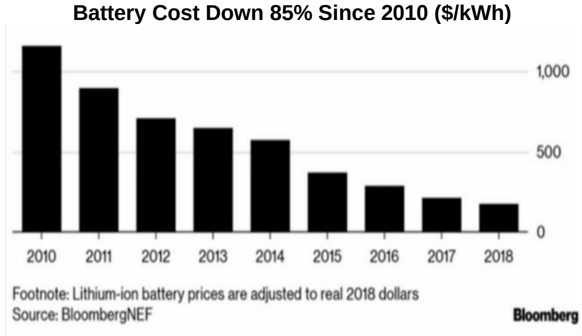
Financing is key to advancing the project

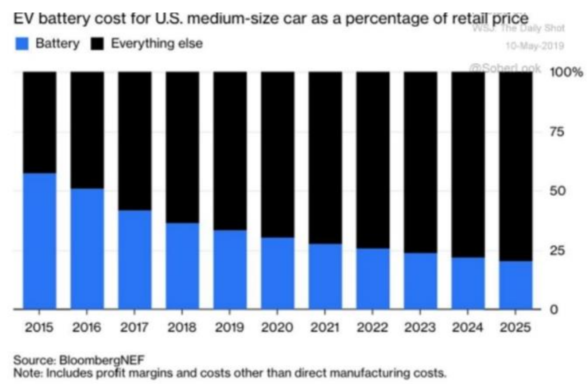
On March 3, 2020, the company received an environmental license for Phase 1. The company's immediate focus is on arranging financing to fund the $7.3 million CAPEX of Phase 1.

Outlook on Graphite

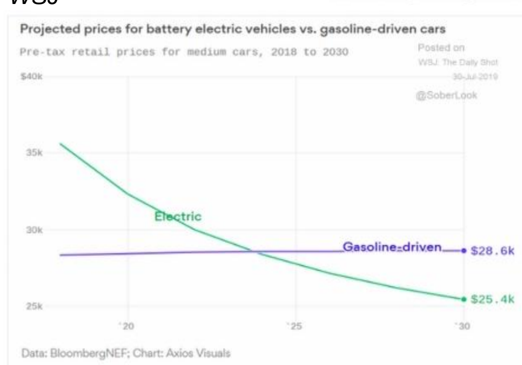
We expect the demand for flake graphite in rechargeable batteries will be the key driver going forward. The growth in Lithium Ion Batteries ("LIBs") is expected to be primarily driven by electric vehicles ("EV"), as well as consumer electronics, and energy storage solutions. Declining technology costs (as shown by the chart below) are also expected to drive demand for LIBs.

Battery Cost Down 85% Since 2010 ($/kWh)





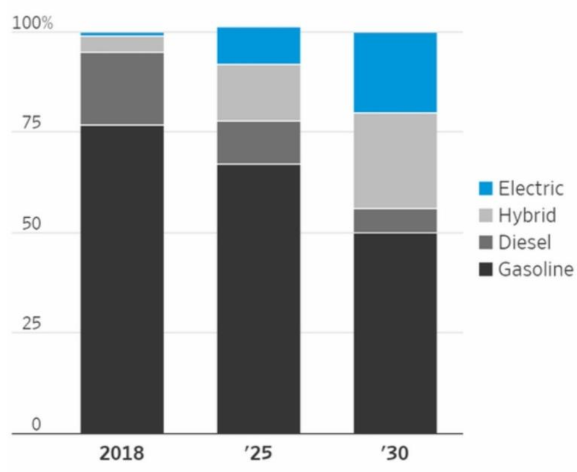
Source: WSJ



Global electric vehicle sales to reach 23 million by 2030

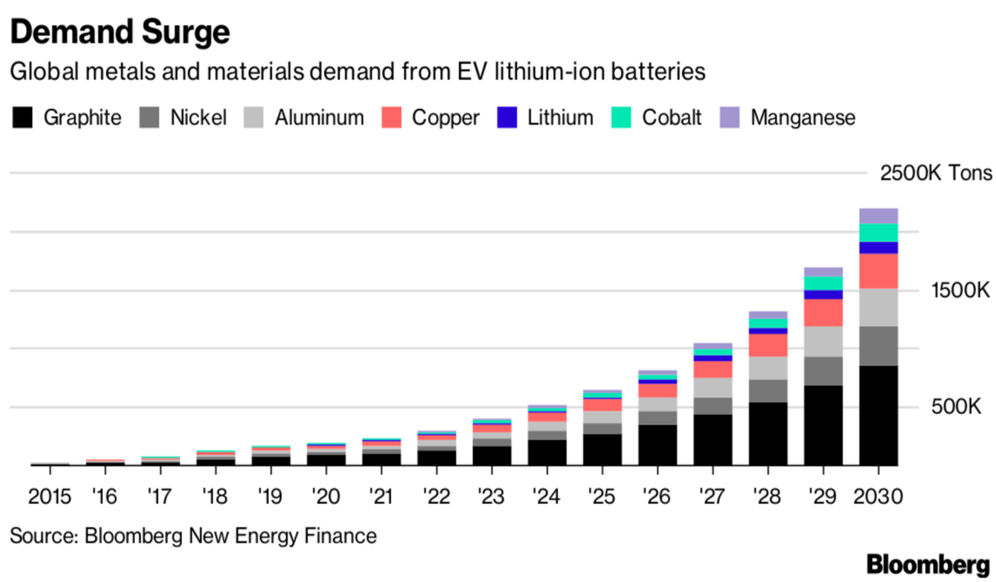
According to the International Energy Agency ("IEA"), in 2018, the global electric car fleet exceeded 5.1 million, up 2 million from the previous year. The IEA expects global electric car sales to reach 23 million by 2030. Roskill expects sales of electric vehicles to reach 17 million units in 2025, and 32 million by 2030.

Expected Market Share



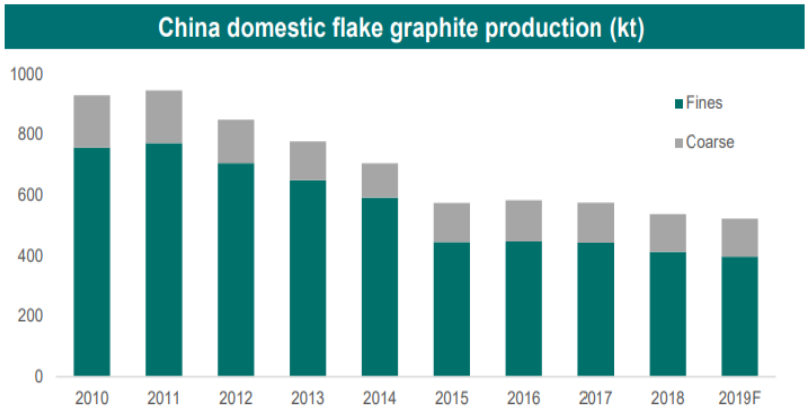
Source: Alix Partners / WSJ

Based on a forecast of 23 million vehicles by 2030, and an average of 75 kg of graphite used per vehicle, we estimate new graphite demand of 0.8 – 0.9 million tonnes per year by 2030. This compares to the current demand for graphite from batteries of only 0.2 million tonnes.



Flake graphite production in China declining

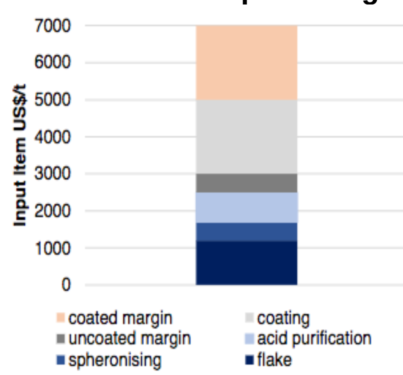
This new demand can be filled by synthetic graphite (1.5 Mt per year market) and flake graphite (0.7 Mt per year market). Flake graphite production from the world's largest producer, China, has been declining as shown in the chart below.



Source: Syrah

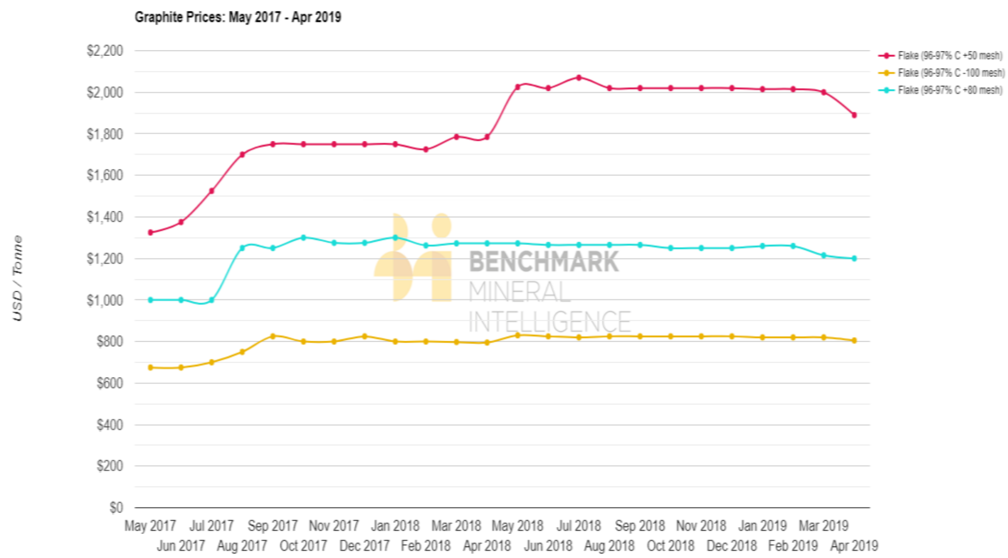
The cost to convert flake graphite to the end products used in batteries (also known as spherical graphite) is approximately US$6k per tonne, as shown in the chart below. As synthetic graphite is priced at US$8k – US$20k per tonne, we believe the that flake graphite pricing needs to be approximately US$3k per tonne or higher for manufacturers to rely on synthetic graphite.

Cost to convert flake to spherical graphite



Source: Company Reports, Canaccord Genuity estimates

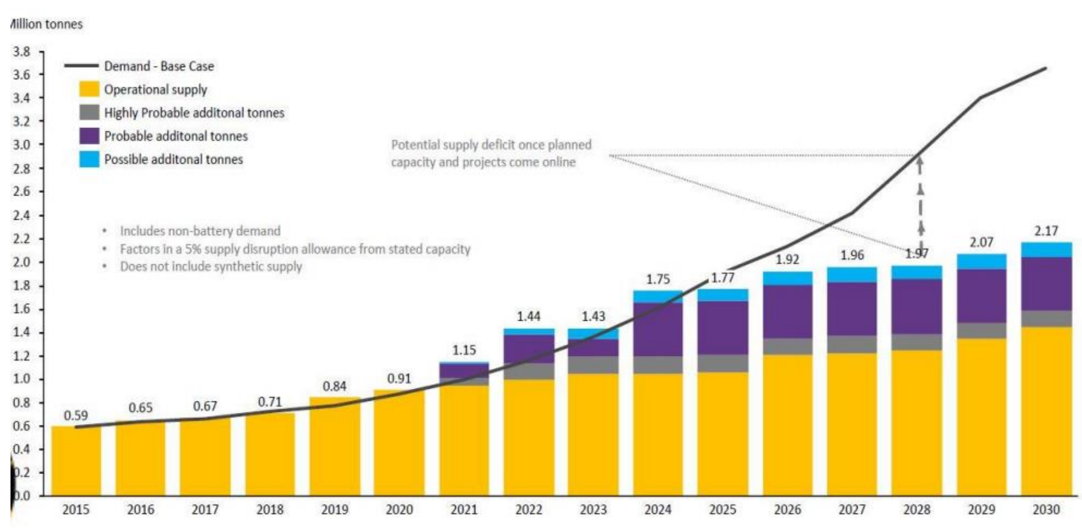
The following charts show flake graphite pricing at different mesh levels. Prices have stayed relatively flat over the past 12 months.



Source: Company

Although we do not expect a significant increase in price levels in the near-term, the long-term outlook on flake graphite remains positive as the market is expected to be in a supply deficit starting 2025.

Supply-Demand Forecasts for Natural Flake



Source: Benchmark Intelligence

Financials

At the end of Q3-2019, the company had cash and working capital of $0.46 million and $0.36 million, respectively. We estimate the company had a burn rate (G&A) of $85k per month in the first nine months of 2019. The following table summarizes the company's liquidity position:

(in C$)	2018	2019 (9M)
Cash	$1,275,577	$456,088
Working Capital	$1,435,158	$356,985
Current Ratio	24.40	3.92
Debt	-	-
Monthly Burn Rate (G&A)	$90,949	$84,909
Cash spent on Properties	$2,194,664	$788,732
Cash from Financing Activities	$4,622,711	$393,900

Data Source: Financial Statements

Stock Options and Warrants

We estimate the company currently has 3.79 million options (weighted average exercise price of $0.38 per share) and 25.23 million warrants outstanding (weighted average exercise price of $0.64 per share). At this time, none of the options or warrants are in-the-money.

Valuation

After incorporating inputs from the PFS and our long-term product price estimate of US$1,300/t, we arrived at a revised Discounted Cash Flow (DCF) valuation estimate of $0.99 per share versus our previous estimate of $1.04 per share. The sensitivity of our fair value estimate to key inputs are shown below.

Valuation Sensitivity		Discount Rate (%)			
		5.0%	10.0%	15.0%	20.0%
Weighted Average Graphite Price (US$/t)	$1,000	$1.81	$0.94	$0.49	$0.25
	$1,100	$2.23	$1.20	$0.66	$0.36
	$1,200	$2.66	$1.46	$0.82	$0.47
	$1,300	$3.08	$1.71	$0.99	$0.58
	$1,400	$3.50	$1.97	$1.15	$0.70
	$1,500	$3.93	$2.23	$1.32	$0.81
	$1,600	$4.35	$2.48	$1.48	$0.92

Source: FRC

The following table shows STS and comparable junior resource companies focused on graphite projects. **Note that none of the projects are directly comparable as there are significant variations in the characteristics (flake size, distribution, grade, etc.) of each project.** On an Enterprise Value to Resource basis, the company's shares are trading at $4.4/t versus the average of $7.5/t.

STS trading at $4.4/t versus the comparables' average of $7.5/t

				In-Situ Graphite				
	Company	Location	Stage	M&I (Mt)	Inferred (Mt)	Grade	% Large Flake (+80 mesh)	EV / Resource*
1	ZEN Graphene Solutions	Ontario	PEA	0.97	0.45	3.6%	n/a	$30.2
2	SRG Mining	Republic of Guinea	FS	1.88	0.16	4.1%	57.00%	$18.4
3	Leading Edge Materials	Sweden	Production-Ready	0.82	0.16	9.3%	40%	$10.8
4	Nouveau Monde Mining	Quebec	PEA	5.08	1.29	4.1%	35%	$10.2
5	Focus Graphite	Quebec	Feasibility	1.77	0.37	14.9%	34%	$7.5
8	Magnis Resources	Tanzania	Feasibility	6.48	2.86	5.4%	55%	$6.2
7	Northern Graphite	Ontario	Feasibility	1.21	0.40	1.7%	77%	$4.4
8	South Star	Brazil	PFS	0.34	0.18	2.3%	63%	$4.4
9	Lomiko Metals	Quebec	Resource	0.59	0.62			$4.2
10	Westwater Resources, Inc.	Alabama, U.S.	PEA	1.88	2.03	2.5%	29%	$3.2
11	NextSource Materials Inc.	Madagascar	Feasibility	6.29	2.37	6.3%	46%	$2.8
12	Graphite One	Alaska	PEA	1.13	8.80	5.8%	59% - 94%	$2.0
13	Syrah Resources	Mozambique	Production	28.71	100.00	11.0%	20%	$0.9
14	Mason Graphite	Quebec	Feasibility	11.29	3.04	5.0%	29%	$0.0
	Average (excl. outliers)			**3.91**	**7.50**	**5.3%**	**44%**	**$7.5**

* Resource = 100% of M&I + 50% of Inferred

Source: FRC / Various Company Websites and Technical Reports

Based on a $7.5/t estimate, our comparables model values STS' shares at $0.08 per share. We are revising our fair value estimate from $0.57 to $0.53 per share, which is the average of our DCF and comparables valuations. **We maintain our BUY rating on STS' shares.**

Risks

We believe the company is exposed to the following key risks (not exhaustive):

- The value of the company is highly dependent on flake graphite prices.
- Development risks.
- Exchange rate risks.
- Liquidity of shares is currently low.

As with most junior resource companies, we continue to rate STS' shares a risk of 5 (Highly Speculative).

Fundamental Research Corp. Equity Rating Scale:
Buy – Annual expected rate of return exceeds 12% or the expected return is commensurate with risk
Hold – Annual expected rate of return is between 5% and 12%
Sell – Annual expected rate of return is below 5% or the expected return is not commensurate with risk
Suspended or Rating N/A— Coverage and ratings suspended until more information can be obtained from the company regarding recent events.

Fundamental Research Corp. Risk Rating Scale:
1 (Low Risk) - The company operates in an industry where it has a strong position (for example a monopoly, high market share etc.) or operates in a regulated industry. The future outlook is stable or positive for the industry. The company generates positive free cash flow and has a history of profitability. The capital structure is conservative with little or no debt.

2 (Below Average Risk) - The company operates in an industry where the fundamentals and outlook are positive. The industry and company are relatively less sensitive to systematic risk than companies with a Risk Rating of 3. The company has a history of profitability and has demonstrated its ability to generate positive free cash flows (though current free cash flow may be negative due to capital investment). The company's capital structure is conservative with little to modest use of debt.

3 (Average Risk) - The company operates in an industry that has average sensitivity to systematic risk. The industry may be cyclical. Profits and cash flow are sensitive to economic factors although the company has demonstrated its ability to generate positive earnings and cash flow. Debt use is in line with industry averages, and coverage ratios are sufficient.

4 (Speculative) - The company has little or no history of generating earnings or cash flow. Debt use is higher. These companies may be in start-up mode or in a turnaround situation. These companies should be considered speculative.

5 (Highly Speculative) - The company has no history of generating earnings or cash flow. They may operate in a new industry with new, and unproven products. Products may be at the development stage, testing, or seeking regulatory approval. These companies may run into liquidity issues and may rely on external funding. These stocks are considered highly speculative.

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