

ELECTROVAYA, INC. (OTCMKTS: EFLVF TSX: EFL)

Dr. Sankar Das Gupta: Electrovaya's Disruptive Battery Technology, Strong Growth Prospects, and IP

KEY POINTS

- Electrovaya focuses on two disruptive tech platforms: Infinity and solid-state. The Infinity Platform (commercially launched) gives the highest safety and longevity without compromise on energy and power, and is based on lithium-ion ceramic technology. As a result, in addition to providing the company with high margins, it also offers the end-user the lowest cost of ownership and a speedy return on investment (3-5 months). Raymond Corp (premium electric brand of Toyota) has become Electrovaya's strategic partner.
- Infinity is a proven disruptive technology. EFL has installed around 20,000 batteries in Mercedes e-cars and thousands of material handling vehicles (adressable market of \$15-20 billion), many of which are produced by Raymond, a Toyota group subsidiary and the largest forklift manufacturer globally.
- The second focus is next-generation solid-state batteries (SSB), which are still in the nascent stage but are a natural evolution.
- Electrovaya offers EVISION, a cloud-based subscription that includes wireless cellular access and provides customers with detailed information on battery health, the status of charge and discharge, and use. This has resulted in a new income stream for the company.
- Electrovaya batteries have been tested by Underwriters Laboratories (UL) and verified safe throughout a broad temperature range.
- The company sells via two channels: OEM and direct sales, which includes the retrofit market. Installed in 80+ locations in the US, EFL batteries are showing rapid growth. Electrovaya now has 30-40 customers, including Fortune 500 companies. The company expects to enter the e-bus and e-truck market by 2023-24.
- To expand its operations to meet demand, Electrovaya has agreed to build a large facility in the US, which will be its first outside of Canada.
- Our prior content on Electrovaya can be accessed <u>here</u>.

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KEY STATISTICS

Price*	\$0.74
52-Week Range	\$0.55 - \$1.37
Avg. Daily Vol. (30 day)	56,503
Shares Out (MM)	146.31
Market Cap (\$MM)	\$108.27
Enterprise Value (\$MM)	\$116.23
Revenue TTM (\$MM)	\$8.45
Fiscal Year End	September
Source: YCharts. *April 18, 2022	

OUR INSIGHTS

The Opportunities

Electrovaya is uniquely positioned to leverage rapid growth in lithium-ion battery demand. Demonstrating the company's progress and technology are its strategic relationships with major OEMs, including Raymond and Toyota. In addition, Electrovaya batteries have started being used by major material handling customers, including Walmart, Mars, Home Depot, and a large online retailer. Additionally, there is also a robust opportunity to retrofit existing lithium-ion units from lead-acid batteries. The company believes there are additional opportunities in buses and Class 3 trucks, and recently inked a supply agreement with Vicinity Motors. Solid-state batteries represent the second stage of growth and are a sea change technology under development, with 2023 targeted for launch.

The Obstacles

The company has successfully pivoted from e-passenger cars to material handling and commercial vehicles. Execution risk exists, although minimised as a few thousand Infinity batteries for e-forklifts have been recently delivered to sophisticated Fortune 100 customers. The performance and commercial viability of the company's SSB platform is still unknown.

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COMPANY OVERVIEW

Electrovaya is a leading manufacturer of safe and long-lasting lithium-ion batteries with differentiated performance and safety attributes, according to the company. The company has two primary battery platforms: Infinity and Solid-state. The Infinity battery platform targets commercial vehicles, including lithium-ion e-forklift, e-bus, and e-trucks. This product has been launched commercially through global partners, including Toyota, Raymond, and Walmart. To date, Infinity sales have been primarily to the material handling industry, which generates the highest margins and where lithium-ion batteries are replacing lead-acid batteries and, to some degree, fuel cells. The company's batteries can also be used in larger grid-scale energy storage. The solid-state platform (SSB) is under development and targeted to launch in 2023, focusing on creating the lowest initial \$/energy (kWh) and highest energy density. The target market for SSB will be e-passenger cars where a low initial cost (sticker price) is required. Electovaya sells its Infinity battery solutions through two primary channels: OEM strategic supply agreements and a direct sales force. It primarily utilizes strategic partners for battery sales into new equipment or vehicle production, and its direct sales force for the retrofit market. In addition to the two battery platforms, Electrovaya also develops cells, modules, battery management systems, software, and firmware necessary to deliver the systems. Electrovaya has substantial intellectual property in the lithium-ion battery sector and continues to carry out research and development activities in lithium-ion batteries, with over 100 patents in their portfolio. In June 2021, a new operating division named Electrovaya Labs was formed to focus on the R&D and commercialization of other disruptive technologies, including next-gen solid-state cells and a unique patented electrode processing technology. Electrovaya Inc. was founded in 1996 and is headquartered in Mississauga, Canada.

The Technology

Infinity Battery Platform: According to Grand View Research, the global lithium-ion battery market was valued at \$53.6 billion in 2020 and is expected to cross \$216.5 billion by 2028, representing a CAGR of 19%. The Infinity lithium batteries are based on proprietary ceramic technologies, allowing improved safety and longevity without compromising energy and power. The EV-44 is Electrovaya's primary lithium-ion ceramic cell and meets the most stringent safety, energy density, cycle life, and performance standards. In addition, Electrovaya's battery systems are designed to be scaled through a modular approach, which provides flexibility for an application's specific capacity requirements.

Solid-State Platform: According to Grand View Research, the global solid-state battery market was valued at \$590.9 million in 2020 and is expected to cross \$5.3 billion by 2028, representing a CAGR of 36%. Electrovaya believes it is well-positioned for this next-generation battery technology. Its division, Electrovaya Labs, focuses on developing solid-state battery technology and has targeted 2023 for the debut of its solid-state battery platform.

Battery Management Systems: Electrovaya's fifth-generation BMS provides the highest levels of cell balancing, IoT functionality, and safety. Reviewed and certified by UL to UL991 and UL1998 for specific applications, it is available for both low voltage and high voltage battery systems. Electrovaya's hardware and firmware engineering team keep advancing and improving this technology to keep up with the increasing demands of the e-mobility industry. Electrovaya has launched a cloud-based battery analytics system for recurring revenues with a subscription model. The system monitors battery health, utilization, and charging to provide customers with optimized fleet and charging management. Furthermore, the system improves the capability and efficiency of troubleshooting and maintenance. Several customers have started using this analytics system.

The Markets

Material Handling: The material handling industry is undergoing a massive sea change from lead-acid batteries to alternative power sources, including lithium-ion and fuel cells. Electrovaya has had notable success in penetrating the material handling market as management believes it has arguably the highest performing battery solution today. In addition, the company's customers have proven meaningful RIOs in material handling compared to lead-acid, showing paybacks as short as 4 months, opening a significant opportunity for new units sold and retrofits.

E-Mobility: In October. 2021, Electrovaya announced a strategic supply agreement with e-bus and e-truck manufacturer <u>Vicinity Motor Corp</u>. for EV buses and fully electric VMC 1200 Class 3 trucks. Management believes this is opening a new market for their batteries, and it is targeting further development and commercialization in this market. The company's solid-state battery platform will also target this market, with an expected launch date in 2023.



EXECUTIVE DISCUSSION

Executives in Focus: Dr. Sankar Das Gupta is the Co-Founder of Electrovaya and serves as CEO.

Shawn Severson: Tell us about your recent breakthroughs with the Infinity Platform.

Sankar Das Gupta: We believe we have a very important breakthrough in the lithium-ion battery world which will impact electric mobility, energy transformation and, ultimately, greenhouse gas reduction and climate-change mitigation.

To recall, Electrovaya has been developing two core battery technologies. The first is the Infinity Platform, which is about a lithium-ion ceramic battery. The other is the solid-state battery (SSB).

The big breakthrough is that the Infinity Platform has been strongly validated by our major partner and commercialized. Its standout feature is an extraordinary cycle life—the highest longevity in the market—and it is arguably the safest battery of its kind. We believe it also has the lowest total cost of ownership. Right now, the battery is being pushed into very heavy-duty vehicles forklifts, essentially—that run 10-20 hours a day, sometimes even 24 hours a day.

On the other hand, our SSBs will be much smaller in dimension because of their very high energy density. The SSB is a good option if someone wants to buy the lowest initial-cost battery. We believe SSBs are perfect for passenger cars.

Shawn Severson: You have commercialized the Infinity Platform now?

Sankar Das Gupta: It is commercialized. The world's most sophisticated automotive or transportation company globally, and the largest industrial manufacturer—Raymond, which is part of the Toyota material handling group—had been testing and validating it and has now partnered with Electrovaya.

At present, however, we can't sell the Infinity Platform batteries to everyone because we don't have enough capacity. We focus on the most demanding market, which gives us the highest gross margins. E-passenger cars are not our focus today, as the margins are not very high, even though we have made a lot of the batteries for Mercedes-Benz, and they even told us, "Your batteries are way, way better than our cars."

In terms of usage, electric forklifts are our most important business. That is an addressable market worth a few billion dollars. You don't see them in public spaces, but they are continuously working inside warehouses, such as those of Walmart, moving things around. This market pays the highest value, so we are focusing there. In addition, electric buses and trucks and autonomous robots would be our clients. The Infinity Platform battery is perfect for those applications.

Shawn Severson: What is the cycle life of the Infinity Platform? What are its typical charging and safety aspects?

Sankar Das Gupta: To start with safety, anything that carries energy will have people worried, whether it be a can of gasoline or lithium-ion batteries. There have been quite a few safety incidents with lithium-ion batteries. There was one last year when two major OEMs launched vehicles that had lithium-ion batteries sourced, perhaps, from Asia.

Within a year, they had to recall the batteries. They are now budgeting about \$1.9 billion for this recall. Safety is very important. Forklifts work inside buildings, and you don't want a fire inside a warehouse. Raymond spent about two years stringently validating the safety of our batteries. They will not run an unsafe battery.

We put around 20,000 batteries in Mercedes electric cars, and there hasn't been a single safety incident so far. This fleet of Mercedes must have done three or four billion miles by now. The level of safety Electrovaya affords is unheard of, so people like Raymond are teaming up with us.

Shawn Severson: Is the Infinity Platform your proprietary technology? Do you have patents for the platform and design?

Sankar Das Gupta: Yes, we have probably 15-20 patents, maybe more, around this technology. The crucial woven ceramic separator is also patented along with electrolytes, additives and cell.



Just to come back to safety, suppose there is some problem in a lithium-ion battery causing a slight temperature excursion of, say, 130 degrees centigrade. The Electrovaya separators will stay firm and ensure the positive electrode does not touch the negative electrode. In addition, we have some interesting electrolytes and components inside that add to the safety. It will stand out if you compare Electrovaya's cells with those from the best automotive companies or the best battery makers in Japan, South Korea, or China.

In this context, Underwriters Laboratories (UL) did a very interesting test—something Raymond insisted we get done. Not many take this test since it is difficult to pass. Raymond's worry was that Electrovaya's battery had tens of cells inside. Suppose one cell catches fire; will it propagate? UL found that it doesn't.

Shawn Severson: Are you aware of other battery makers that have achieved UL status?

Sankar Das Gupta: In terms of fire propagation and safety, we haven't seen anyone come even close to us. Some battery makers have done UL safety tests by compromising their energy and power. They use a technology called lithium-iron-phosphate, which has got probably half, or 60%, of the energy of our NMC (nickel, manganese, cobalt oxide) material.

Shawn Severson: Does the SSB also have better safety versus traditional lithium-ion batteries? Has it reached the holy grail of safety?

Sankar Das Gupta: The progress has been good on SSBs, and work continues. Safety and Energy density are key performance drivers. I am encouraged by our research progress. Another factor is manufacturability of SSBs. Electrovaya has unique experience in manufacturing and scale-up. The Electrovaya breakthrough in SSBs is in the unique interface and ceramic separator. Multiple patents are filed in this area. We tend to dislike large lithium metal anodes. But if there is a temperature excursion, the lithium metal, because of its very low melting point of about 170 degrees centigrade, becomes a liquid, a blob, and travels everywhere. That can be a horrendous safety mess.

Shawn Severson: What is the total cost of ownership, the ROI, of the Infinity Platform?

Sankar Das Gupta: This is something Raymond also wanted to specifically know—the cycle life or the longevity of the Infinity Platform. They tested it themselves and found the delta very large compared with other batteries. Extended cycle life, as you know, reduces the total cost of ownership. Our clients, such as Walmart, Home Depot, and Mars, always look at holistic costs. They are sophisticated buyers.

The ROI depends on usage, but you could probably get it all back in 3 to 5 months—as quickly as that. It is such a fast ROI that it ends all discussion on what technology should be used in forklifts.

And this market is massive. About 2.6 million forklifts are wandering around in the US alone. Globally, there are probably 3x to 4x more. We sell our batteries at \$15,000-20,000 each. Some cost \$30,000, depending on the size of the vehicle. So, if a typical addressable market is I million vehicles in the US, the addressable market is \$15-20 billion. Also, this is a sophisticated market where people can tell a good battery from a not-so-good one.

As a complementarity, we have just started offering a cloud-based subscription called EVISION. It gives users complete data on battery health, state of charge and discharge, and utilization. It also informs how the vehicle is doing. This battery management system (BMS) has wireless cellular connectivity and offers data on a very nice dashboard.

Shawn Severson: Does this BMS preserve safety? Will it alert if a battery is going bad so that it can be pulled out in time?

Sankar Das Gupta: Yes, there are software triggers embedded, essentially AI, which does not need human interface to keep the product safe. The software is also good for warehouse management. Some major companies have started using the analytics so generated. For us, this has become a nice subscription-based revenue stream with a decent gross margin, and it is paying for itself.

We have also signed a strategic sales agreement with Raymond, and they are a wonderful partner with a massive distribution channel. You can visit their website and read their white papers on the Electrovaya battery and its breakthrough technology resulting in unparalleled



safety and longevity. They took almost two years validating the Infinity Battery line, and now we have teamed up.

Shawn Severson: Does your agreement with Raymond apply to retrofit and replacement (of lead-acid and older lithium-ion batteries) sales also, since that is an important differentiation in the material handling market?

Sankar Das Gupta: Absolutely, Raymond would sell batteries for both new and the replacement market. We have two sales channels. The first is the OEM or the Raymond channel. We also have another direct sales channel through which, for example, we went to Walmart. Walmart's first warehouse was a 100% retrofit deal. We moved all their technology, whatever they were using, and put in Electrovaya technology. They used it for over a year and liked what they saw. Now we have retrofitted some of their other distribution centers. It is going well on both the new vehicle and retrofit sides. We have also just completed retrofits for some of the Home Depots in New York City—about five or six locations.

While we are focused on forklifts because that is such a massive market, other new markets are emerging, such as electric buses and trucks. We are working with many OEMs in those spaces. We foresee this market taking off from probably 2023 or 2024.

But the forklift segment is what gives us the highest margins, and the momentum there is accelerating. In September 2021, we had about 60 sites, and now, we have over 80. Large companies are coming from every category—the massive e-commerce folks, the distribution center folks, the cold/freezer storage folks. The last one has quite an interesting application. Their forklifts never leave the minus 20 degrees zone. They get recharged in very cold places, operate in cold places, and people drive them wearing overcoats. Those forklifts have been running beautifully.

Shawn Severson: When you started rolling out, what were the hindrances to scaling for very large-scale distribution centers—from a few facilities to a massive number? Do clients take this one bit at a time? What is their mindset, and how do they roll these things out over the longer term?

Sankar Das Gupta: This is a very conservative business that hasn't seen new technology for some time, though people have been playing around with hydrogen fuel cells since 2007. For example, take this particular group, which is the world's largest retailer. They asked for two batteries from us and tested those for about eight months, running them 24-hours a day, seven days a week. Then found it pretty good and asked us to retrofit 100-200 vehicles in one distribution center. That was a few million dollars.

They observed the performance for around 18 months and asked us to retrofit their second and third distribution centers. Now it is rolling across. Some groups are faster, and potential clients can now verify data from Raymond and others.

Another example is of a big confectionery maker who told us to retrofit their first distribution center based on the work we did for Walmart. They have 60-70 distribution centers that will need retrofits. We retrofit when their lead-acid batteries need replacement after a few years' usage.

We are picking up any new demand—not just for retrofit. Consequently, we foresee big growth over the next couple of years.

Shawn Severson: Can we expect you to be cash-flow positive in fiscal year 2022?

Sankar Das Gupta: Yes, we will be EBITDA positive.

Shawn Severson: Per your agreement with Raymond's new forklifts, how many are electric and can be fitted with Electrovaya's batteries? What is the market opportunity there?

Sankar Das Gupta: The new vehicles from Raymond are 100% electric. Our focus has always been on the larger vehicles. We do not sell the small batteries—what they call 'walkies.' There is not enough margin there. Raymond sells our integrated lithium batteries which are exclusive in 25-30 of their truck models. We think demand is now coming up very nicely.

Shawn Severson: Where does your relationship with Walmart stand today, and where is it going?



Sankar Das Gupta: The relationship is good. They were a critical customer two years ago because we probably had three customers. Today, we have 30-40 customers. We are strengthening our relationship with Walmart and others, including e-commerce sites growing like gangbusters.

Shawn Severson: You had a large e-commerce retailer as a client. Is that an active relationship?

Sankar Das Gupta: Very much so. Last year, we retrofitted two of their distribution centers. They observed the performance for 6-8 months and this January, gave us a \$6 million order.

Shawn Severson: What is your plan on capacity? What can you do today, and what do you need to do in the future to make sure you can deliver as per demand?

Sankar Das Gupta: We just signed an agreement for a large facility in the US. We see the demand and think we will need multiple plants. The first plant is working nicely, and the second will be coming up in the US.

Shawn Severson: Any closing comments?

Sankar Das Gupta: The Infinity Battery Platform is a disruptive technology in the Li-Ion space. It has uniquely superior safety and longevity, without compromising energy and power. The Infinity line recently launched commercially and a growing number of Fortune 500 companies are repeat users. We also believe, Electrovaya's SSB (solid-state battery) is another potentially disruptive technology.

Electrovaya is a technology intensive company with a strong IP. We are delighted the market for energy transformation and decarbonization is now finally emerging, so things are looking good.

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ABOUT THE ANALYST



Shawn Severson President & Co-Founder

Head of ClimateTech & Sustainable Investing Research Shawn Severson is President & Co-Founder of Water Tower Research and is a member of the Board of Managers. Prior to co-founding Water Tower Research and previously founding predecessor firm alphaDIRECT Advisors, Shawn spent over 20 years as a senior equity research analyst covering the Technology and ClimateTech sectors, including senior positions at JMP Securities, ThinkEquity, Robert W. Baird (London), and Raymond James.

Shawn started his career as an Equity Research Associate at Kemper Securities. Shawn was frequently ranked as a top research analyst, including one of the Wall Street Journal's "Best on the Street" stock pickers and a StarMine Analyst Awards Top 3 stock picker. Shawn holds a BA in Finance and Economics from Augustana College.



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