

Next Generation Manufacturing Canada

ZEV Project Fact Sheet

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Advanced Manufacturing Process Innovations – Flex-Ion Battery Innovation Center

Lead: Ventra Group Co. (ON)

Partner: eCAMION Inc (ON)

The Flex-Ion Battery Innovation Center, a division of Ventra Group Co., will establish a centre of excellence for advanced Li-Ion battery manufacturing, in collaboration with partner eCAMION. The partners will focus on several core manufacturing process innovations including: (a) reducing average battery cell formation and aging time from 6 to 3 days, thereby lowering manufacturing costs by 10% and doubling manufacturing output over current technologies; (b) developing a dry coating process for battery electrodes, thereby eliminating energy-intensive, time-consuming and costly drying steps from the cell manufacturing process; (c) reducing average slurry mixing time from 12 hours to 3 hours, thereby assuring quality control and enabling noteworthy energy savings; (d) using the Battery Innovation Center's produced cells to create an integrated energy storage system, thereby reducing the facility's own grid-based electricity requirements, lowering its impact on the upstream electrical infrastructure and minimizing energy operating expenses, and (e) applying predictive AI to thermal and optical machine vision technologies to improve slurry homogeneity and reduce electrode manufacturing scrap.

Next Generation Grafoil Plate Forming Pilot Line

Lead: Ballard Power Systems Inc (BC)

Partners: Macrodyne Technologies Inc (ON), and Eclipse Automation Inc. (ON)

Ballard Power Systems Inc. and partners Macrodyne Technologies Inc. and Eclipse Automation Inc will work to develop new manufacturing methods via process improvements and new inspection methods. The development of the new manufacturing processes creates a potential opportunity for the project partners for future fuel cell plate fabrication capabilities and increased automation.

Green Recycling of EV Battery Black Mass

Lead: Cnem Corporation (ON)

Partners: Talon Metals Services Inc. (ON), Palcan Energy Corporation (BC)

Cnem Corporation and partners Talon Metals Services Inc., and Palcan Energy Corporation will develop a new recycling process to process EV battery black mass using an environmentally friendly approach. This green, energy-effective process would be applicable to recycle black mass of all lithium ion-based batteries and the project aims to develop a mini plant to demonstrate the scalability of the process with an annual capacity of 20 metric tons of spent lithium-ion batteries.

AI-Assisted Smart-Optic Manufacturing of Modular EV Systems

Lead: Damon Motors Inc. (BC)

Partners: Darwin AI (ON), Moment Energy Inc (BC)

Damon Motors will construct a 110,000 sq ft state-of-the-art cleantech EV manufacturing centre for Damon's flagship HyperSport and HyperFighter all electric smart motorcycles. This center aims to create over 300 new high-tech manufacturing jobs, and over 500 operations jobs by 2025. Together these

partners will showcase key innovations to address the full manufacturing production and end-of-life recycling of EV battery systems. The consortium will showcase these systems at both Damon and Moment Energy's new facilities in Vancouver BC, demonstrating manufacturing scale-up of components, assembly systems and targeting design for a near zero waste production operation.

Center of Excellence for High Volume Manufacturing of Hydrogen Fuel Cells

Lead: Cummins Inc. (ON)

Partners: AIS Technologies Group (ON), Shelley Industrial Automation (ON), Konnexio Inc (ON)

Canada, with two major suppliers of Hydrogen Fuel Cells (HFCs), has emerged as a global leader and a home to a significant concentration of global Hydrogen & FC expertise & supply chain network. Cummins, which acquired Hydrogenics Corporation in 2019, and partners AIS Technologies, Shelley Industrial Automation and Konnexio Inc. will build a pilot production process for their core technology and Center of Excellence for high volume manufacturing of hydrogen fuel cells. The consortium will collaborate with universities like UofT, Ontario Tech and Waterloo to address some of their material development and technology improvement requirements and characterization.

Next Generation Membrane Electrode Assembly

Lead: Momentum Materials Solutions Corp (AB)

Partners: BlissEarth Energy Research Inc (AB)

The membrane electrode assembly (MEA) is the heart of a hydrogen fuel cell. The global market for MEAs is projected to be \$15 billion by 2025. However, the cost of producing MEAs is high and the durability is often poor. Momentum Materials Solutions, a University of Calgary spin-off venture, has developed new MEA technology that shows reproducible high performance, high durability, and low cost which is a potential solution for the hydrogen fuel cell market. Momentum Materials Solutions Corp and partner BlissEarth Energy Research Inc will focus on the development of a high-performance MEA product based on Momentum Materials Solutions' patented technology and the manufacturing scale-up of its MEA production.

Advanced Manufacturing Scale-up of Critical Zero Emission Vehicle Components

Lead: Precision Resource Canada Ltd (ON)

Partner: Miltera Machining Research Corp (ON)

Precision Resource Canada and partner Miltera Machining Research will combine knowledge and expertise from across the globe to achieve best-in-class advanced manufacturing solutions that establish, scale-up and commercialize critical zero emission vehicle components for universal on-road mobility platforms. In addition to on-road mobility the technology can be leveraged to produce sustainable green energy, stationary and back-up power, and has the potential to transform other critical industries such as aerospace, off-road and heavy duty applications.

Scalable Manufacturing Process for Solar Film Integrated Body Panels

Lead: Rayleigh Solar Tech Inc (NS)

Partner: Magna International (ON)

Rayleigh Solar Tech Inc and partner Magna International are collaborating to achieve two outcomes. First, to develop a production-ready process for fabrication of solar integrated automotive polymer panels. Second, to optimize Rayleigh's solar thin film manufacturing process for application in Magna's

automotive polymer panel manufacturing process. The energy from the polymer panels can be used to extend the vehicles range and reduce GHG emissions by reducing consumption of grid electricity produced from fossil fuels.

Pilot line for novel Li-ion thermal management solution

Lead: Calogy Solutions (QC)

Partner: Linear Automation (ON)

Calogy Solutions is a rapidly growing startup with a novel and patent pending battery thermal management solution for Li-ion batteries in electric vehicles called TGP (Thermal Ground Plane). Along with partner Linear Automation, the consortium will develop an intelligent pilot manufacturing line for the TGP with an innovative and unique manufacturing method (magnetic pulse welding), automation and AI. It will be designed for high throughput but will initially enable Calogy to offer test samples to its customers before a large volume order.

Scale Up of Next Generation Li-ion battery electrode processing technology

Lead: Electrovaya Inc (ON)

Partners: Lantern Machinery Analytics Inc (BC), Eecomobility Inc (ON)

Lithium ion batteries have become critical energy storage devices for the rapidly developing electric vehicle market, however the manufacturing processes used to produce them remain expensive and environmentally problematic. Current commercial electrode manufacturing processes employ a slurry mixing/coating method for which the hazardous solvent N-Methyl-2-pyrrolidone (NMP) is extensively used. NMP-free electrode processing has the potential to not only reduce the environmental impact of lithium ion battery manufacturing, but would also enable a breakthrough in cost reductions which could realize significant global benefits. This project will bring a proprietary NMP-free electrode processing technology to a commercial scale through collaboration between Electrovaya, Machinery Analytics, and EECOMOBILITY.

Automated Module Assembly with Advanced Laser Welding and In-Line QC

Lead: Electrovaya Inc (ON)

Partner: Eecomobility Inc (ON)

This project aims to develop pilot advanced manufacturing capabilities for high voltage electric truck and bus battery modules in Canada and will be carried out through a collaboration between Electrovaya and EECOMOBILITY. The partners will implement a versatile, semi-automated laser welding manufacturing pilot line compatible with a range of module architectures. After the success of this project Electrovaya will work on scaling up the module assembly manufacturing line and supply made-in-Canada modules for heavy duty e-mobility applications.

Recycling of Solid State Lithium Battery Materials for EVs

Lead: Li-Metal Corp (ON)

Partner: Blue Solutions Canada Inc. (QC)

Li Metal is partnering with Blue Solutions to develop a lower cost, lower carbon passenger electric vehicle format solid-state battery for next-generation automotive platforms. The project will focus on the development of high-performance ultra-thin lithium metal anodes suitable for use in large-format all-solid-

state pouch cells for automotive applications and which will include recovered lithium metal from both end-of-life batteries and production by-product generated at Blue Solutions manufacturing operations in Quebec. The lithium metal will be reprocessed using refining technology to be developed during the course of the project, for circular re-introduction into Blue Solutions' cell production process both in lithium ingots as well as in next-generation physical vapor deposited (PVD) ultra-thin anodes. For more information visit: blue-solutions.com/en/ and li-metal.com

Manufacturing Process for Compact ZEV Inverters

Lead: Linamar (ON)

Partner: Westhill Innovation (ON)

Linamar will partner with Westhill Innovation to leverage Westhill's SunShifter design for an inverter used in zero-emission vehicles that uses 1/10th space and mass of other competing inverters. This project proposes to develop a manufacturing process to manufacture compact, lightweight inverter components used in ZEVs.

Manufacturing Sustainable Lithium Extraction Modules

Lead: Summit Nanotech Corporation (AB)

Partner: Ionic Solutions (AB)

Summit Nanotech is using advanced materials to disrupt and transform conventional lithium mining processes by manufacturing and exporting environmentally sustainable lithium extraction modules. Summit uses patent pending nanotechnology-based materials that will be deployed in extraction modules for lithium mining customers globally. Along with partner Ionic Solutions, these advanced materials will be used in a process designed to double lithium yield, reduce GHG emissions by 50%, minimize freshwater use, reduce land use area 26x, and cut chemical waste by 90% compared to traditional methods.

The proposed project is to build out the manufacturing and assembly line for advanced materials and the extraction modules. These modules will be built to align with the life cycle of a typical lithium production facility, processing commercial volumes to deliver lithium rapidly to lithium ion battery manufacturers. Our extraction process consists of compartmentalized units that function in unison to perform the extraction process.

Advanced Manufacturing Methods and Equipment for ZEV Propulsion Batteries - Flex-Ion Battery Innovation Center

Lead: Ventra Group Co. (ON)

Partner: Inspectech Analygas Group Inc. (ON)

Flex-Ion Battery Innovation Center, a division of Ventra Group Co. in collaboration with Inspectech Analygas Group Inc. will develop and commercialize advanced manufacturing innovations and equipment to improve the performance of electric vehicle propulsion batteries and battery manufacturing systems. The partners will: (1) develop a localized mineral supply chain to enable cost-effective Li-Ion cell manufacturing in Canada, resulting in a 20% material cost reduction; (2) create an advanced carbon shell silicon anode, supporting a 15% battery cell energy density increase; (3) apply advanced 'jelly-roll' pouch-style cell manufacturing processes to prismatic battery cell manufacturing, driving a further 5% energy density increase; (4) design and analyze advanced algorithms to accelerate cell formation and reduce cell

manufacturing time by 50%; (5) design and test an in-line quality control system incorporating AI-based correlation algorithms that identify and characterize welding defects inside Li-Ion cells, leading to a 50% reduction in scrap; and (6) develop hybrid polymer-metal structures for battery packs and modules to reduce overall battery pack weight by 20%.