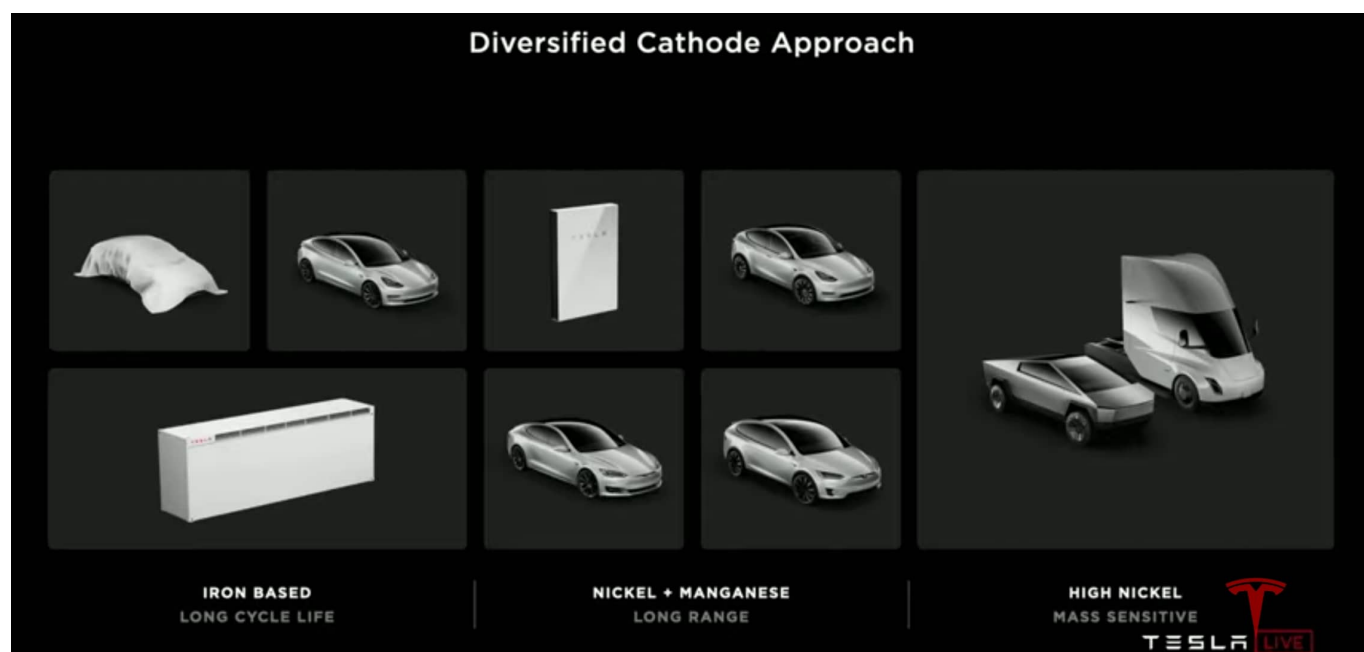


Nano One looks to be moving in the same direction as EV leader Tesla

At Tesla Battery Day in September 2020 Tesla discussed how they plan to have a three prong approach to batteries – Lithium Iron Phosphate (LFP), **Nickel Manganese (NM or LMN)**, and high nickel (NCA or NMC). Today I look at the nickel manganese battery and a company that is moving in the same direction as Tesla. That company is Nano One Materials Corp. (TSXV: NNO) (“Nano One”).

Tesla’s planned mix of battery cathode types – Li Iron Phosphate (LFP), Nickel-Manganese (NM), high nickel (NCA) (NMC)



Source

Nano One specializes in improving battery cathodes. In particular the Company’s focus is to make low cost, high performance, cathode powders used in lithium ion batteries.

In October 2020, Nano One announced that they have developed a breakthrough in longevity for a cobalt free high voltage battery that has been successfully demonstrated at automotive rates of charge and discharge for over 900 cycles. The battery uses a low cost, cobalt-free **Lithium Nickel Manganese (LNM)** cathode active material made with Nano One's proprietary One-Pot process.

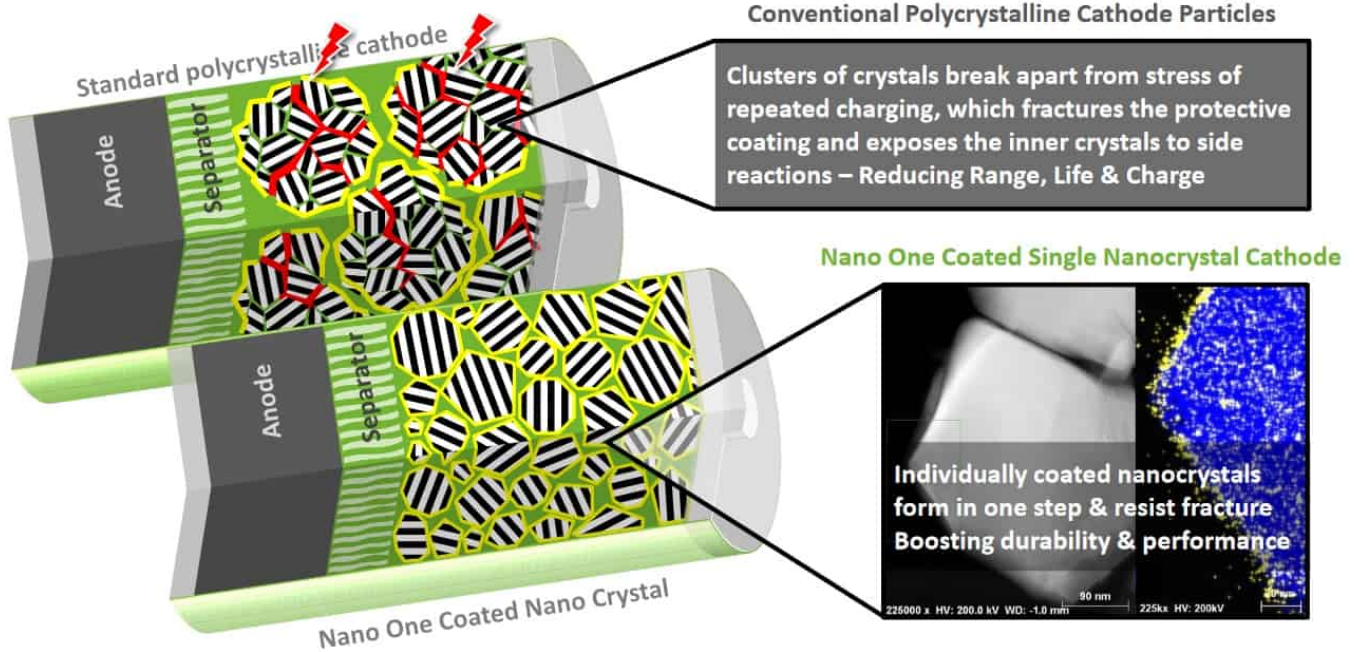
The problem with removing the cobalt can be that the battery becomes less stable or has a lower lifespan (less cycles). However in this case Nano One has managed to achieve 900 cycles, which is heading towards the 1,500 cycles that a Tesla Model 3 achieves using a more expensive nickel-cobalt-aluminum (NCA) battery. The other reason for removing cobalt is that the world supply of cobalt is limited and mostly comes from the Democratic Republic of the Congo – A country rampant with issues such as corruption, child labor and exploitation. Many analysts are forecasting severe cobalt supply shortages after 2023 just as the EV boom takes off. This explains why Tesla and Nano One are working towards a nickel-manganese battery with no cobalt.

Nano One's Chief Technology Officer Dr. Stephen Campbell explains:

"We are able to avoid rapid capacity fade and premature failure and have successfully demonstrated a high voltage lithium ion battery cell with significant cycle life – this is an exceptional outcome. The enabling technology is Nano One's patented LNM cathode material operating up to 4.7 volts and made using our patented One Pot process. **The LNM voltage is 25% higher than commercial lithium ion batteries, improving efficiency, thermal management and power."**

Nano One's Coated Single Nanocrystal Cathode gives a performance advantage

Nano One Performance Advantage



Source

In June 2020, Nano One announced the development of a coated, **single crystal cathode** material for lithium ion batteries that is providing **up to 4 times improvement in longevity**. The technology is applicable to all of Nano One's cathode materials.

Perhaps not surprisingly, Nano One was able to raise an oversubscribed equity raising of approximately \$14.37M at an offering price of \$2.72 per Unit (one share and half a warrant). The Company intends to use the net proceeds for research and development, capital equipment purchases and facility expansion, intellectual property acquisition, business development, working capital and general corporate purposes.

Nano One continues to have successful breakthroughs in improving lithium-ion battery cathodes, most importantly in all types of cathodes (iron based, nickel-manganese, and high nickel-cobalt). Combine this with their excellent established development partners Pulead (the global leader in LFP cathodes), Volkswagen (a leading OEM), and Saint-Gobain then

it should not be surprising to see Nano One start to commercialize their patented technology in the near future.

The global cathode market is forecast to be a US\$23 billion market by 2025 and includes a US\$1 billion potential licensing opportunity which Nano One is targeting. Nano One's goal is to achieve ~\$70M pa in revenues by 2025 at high profit margins.



Nano One's stock is up 118% over the past year so early investors are certainly being rewarded. With the EV boom set to accelerate due to Tesla's planned US\$25,000 car by 2023, it should leave plenty of opportunity for Nano One to make their mark.

Nano One's Dan Blondal on improving the performance, durability, and safety of lithium-ion batteries

"We use a process that is environmentally friendly, we have no waste stream, we combine all of the coating and crystallization and all of the preparation of nickel, manganese, and cobalt all into one step. So there are fewer steps, there's less energy consumed, less waste, and results in a longer-lasting battery material that could lead to more durable battery." States Dan Blondal, CEO, Director & Founder

of Nano One Materials Corp. (TSXV: NNO), in an interview with InvestorIntel's Ron Wortel at PDAC 2020.

Dan went on to say that Nano One has developed intellectual property and patents to make battery materials that can improve the performance, durability, and safety of batteries. Dan also spoke on Tesla's million-mile battery. He said that Tesla has used cathode material supplied by a Chinese manufacturer in the battery. Dan continued, "Nano One has intellectual property and patents that have nanocrystalline coated material which is very much akin to what they were using except ours is commercially viable." Dan also provided an update on Nano One's other battery technologies. He said that the company is working on lithium iron phosphate batteries used in electric buses, grid storage, etc. Nano One is also working on cobalt-free battery material which is aimed at next-generation solid-state batteries.

To access the complete interview, [click here](#)

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**Nano One's Dan Blondal on
making longer-lasting,
longer-range battery
materials for electric**

vehicles

“Cathode manufacturing is about taking sources of lithium, nickel, manganese, cobalt, iron, phosphorous and combining them into a mixed metal oxide. Basically it is a ceramic powder. Each of the little kernels of powder is a composite crystal structured material that has layers lithium, nickel, manganese, and cobalt that allows you to charge and discharge... What we do differently at Nano One is we have developed a way to make these materials. We have not changed the formulation of the material but we have changed how we make the underlying crystals. It is the formation of those crystals and the raw materials that we choose to put in which help reduce the cost. The number of steps we use is far less than the number of steps the industry uses...We add everything together, coatings included. We eliminate a bunch of steps as a manufacturing advantage. The crystal structures that come out of our process are highly purified crystal structures that are less susceptible to cracking and degradation mechanism when you assemble them into a battery and when you charge and discharge the battery. We are shooting to improve the longevity and durability of those materials. By doing that, we are enabling electric vehicle manufacturers and battery producers to make a longer-lasting and longer-range battery for electric vehicles.” States Dan Blondal, CEO, Director and Founder of Nano One Materials Corp. (TSXV: NNO), in an interview with InvestorIntel’s Jack Lifton.

Dan went on to provide an update on Nano One’s joint development work with Pulead Technology. He said that Nano One and Pulead are working together to design a next-generation manufacturing facility for the production of lithium iron phosphate (LFP) cathode materials. Lithium iron phosphate batteries have a very strong future because they are the safest, longest-lasting and security of supply is high.

To access the complete interview, [click here](#)

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Nano One achieves a new US patent for high energy cathode materials

Nano One Materials Corp.'s (TSXV: NNO) mission is to have its core technology be a dominant industrial process for the production of high-performing nano-structured materials worldwide. A key focus for Nano One is improving the lithium ion battery, and more recently reducing the cost and boosting the performance of lithium iron phosphate (LFP) cathode batteries. LFP cathodes are popular in China due to lower cost and greater durability, and are almost exclusively used in electric buses, energy storage, and also many electric cars.

Cathodes Overview



Nano One's ongoing joint development partnership with Pulead Technology Industry is showing compelling economic advantages

that are exceeding internal targets.

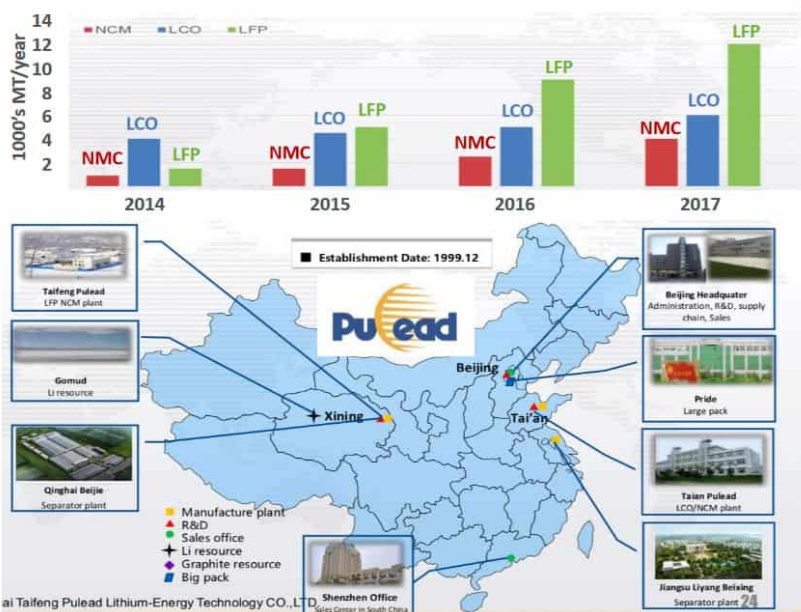
Using Nano One's patented technology the goal is to develop and evaluate the optimized scaled up production of LFP cathode materials for the use in lithium ion batteries. The joint partnership will be exploring licensing and commercialization opportunities as part of the collaboration.

Having identified a low cost, high purity, high volume source of iron that enables the process, Nano One is able to eliminate an intermediate step in the supply chain. The savings from that are very much in line with the Company's goals as joint development work now proceeds to determine the full scale production economics and an optimized path to commercialization.

Mr. Dan Blondal, CEO of Nano One commented: "Nano One's technology mixes lithium, iron, phosphate, and a carbon coating in a one pot process and the joint development results have exceeded our targets in terms of both cost reduction and performance."

Nano One's partner joint development Pulead is a global leader in cathodes for Li-ion batteries

NNO Joint Development Partner – Pulead



Large Cathode Company w/ 15% market share

Pulead has **20+ customers**  

200kT LFP market in 2025 (\$2B)

Co-develop Next Gen Plant

Proven, respectful licensee

- LFP 
- NMC 
- LCO 

Joint development partner Pulead

Pulead Technology is a global leader in LFP production looking to expand its capacity in a rapidly growing market. As a major source of revenue, Pulead is excited by the commercial opportunity presented by Nano One's ground breaking innovations. Considered globally to be the safest, the longest lasting and the lowest cost of all lithium ion batteries, market demand for LFP is anticipated to double to over 200,000 tonnes per year in 2025. Seen as an environmentally superior alternative to lead-acid batteries, LFP batteries are most widely used in China where officials have reported that 61% of passenger vehicles and 94% of buses will use LFP batteries.

Nano One has several other partners including Saint-Gobain and Volkswagen Group Research.

Nano One achieves a new US patent for high energy cathode materials

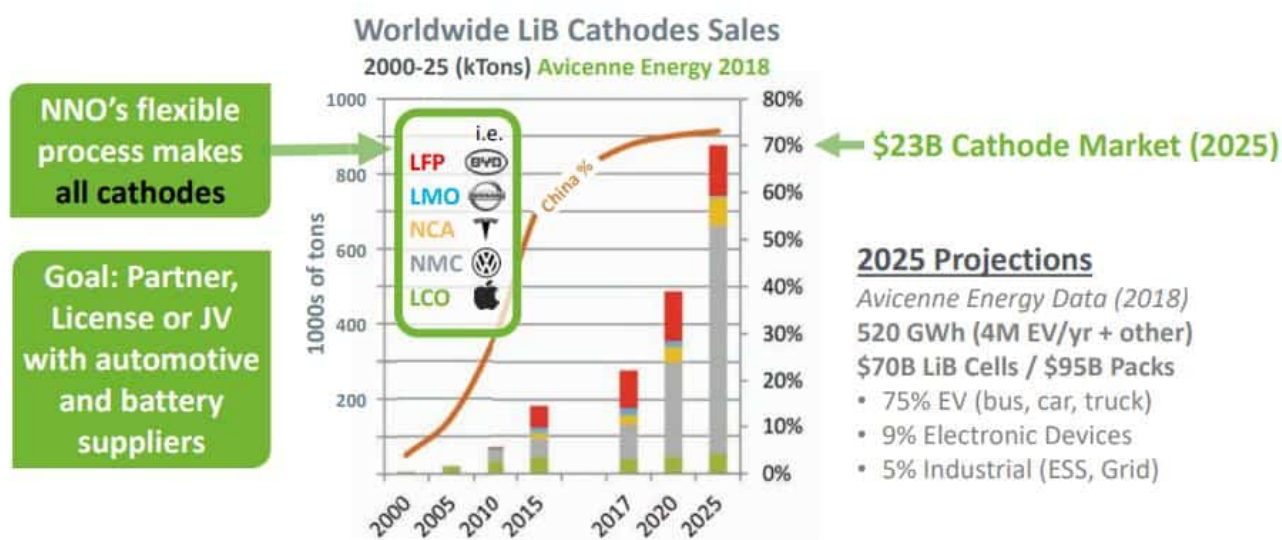
In the race to commercialize lithium ion battery powered electric vehicles, Nano One has been issued a new US Patent that adds value to Nano One's high energy cathode materials. It defines the unique physical form of the powdered materials and provides a proprietary means of improving durability, safety, handling, and cost. This is a significant process as it defines the properties of cathode powders rather than the process to make them. The new patent will complement Nano One's process patent portfolio and will add to the Company's strategy, alongside key partners to develop a new generation of low cost and durable high energy cathodes. This is an important cornerstone in the execution of Nano One's business plan and provides valuable leverage going forward.

Nano One and Pulead's LFP battery partnership offers the power to change the electric vehicle market.

Lithium Iron Phosphate (LFP) cathode for Li-ion batteries is very popular with heavier and lower range electric vehicles, especially in China. Although it is less energy dense than Nickel Manganese Cobalt (NMC) it is more durable and cheaper (no cobalt). This is making it popular in China with e-buses, e-trucks, energy storage, power tools and shorter-range electric cars. BYD Co. leads the world in e-buses so they like LFP cathodes for many of their vehicles.

The cathode market is forecast to be a USD\$23 billion market by 2025

Nano One Cathode Market Opportunity



Nano One Materials Corp. (TSXV: NNO) is a Canadian technology company with a scalable industrial process for producing low cost high performance battery materials. The Company will be

concentrating on LFP cathode in the near term using its proprietary low cost cathode making processes.

Nano One has recently entered into joint development agreements with two large companies.

Nano One agreement with Saint Gobain

The Saint Gobain deal announced last December brings credibility as they are a major global ceramic materials company. This collaboration with a €40.8 billion ceramics giant like Saint-Gobain is a smart move by Nano One.

Nano One agreement with Pulead Technology Industry

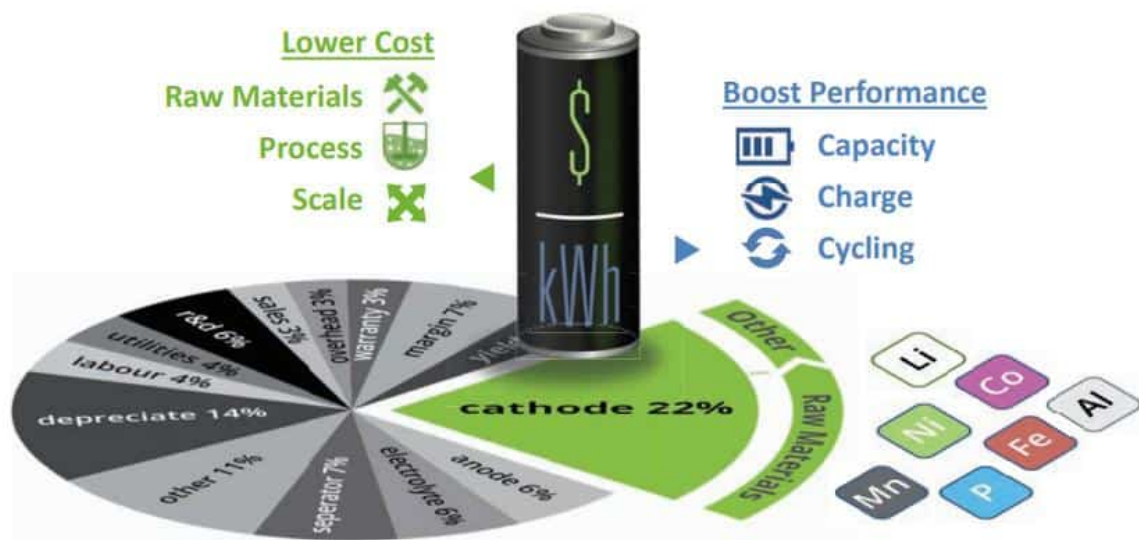
The second deal is with Pulead Technology Industry and has Nano One excited. This partnership was announced on January 25, 2019. The objective of this joint development effort is to identify a viable supply chain and design a low cost LFP plant using Nano One's proprietary processes. Pulead is one of the most trusted and established cathode manufacturers in China. In fact, they supply LCO cathode materials to Amperex Technology Limited (ATL) who make batteries for Apple and are expanding their capacity to capture a greater portion of the LFP growth opportunity.

CEO of Nano One Materials Corp., Mr. Dan Blondal stated: "After two months, our teams are working well together and developments at the lab and pilot scale are moving along at a good pace. We have identified viable raw materials, are refining our processes, and are evaluating resulting materials against target specifications. Performance targets and economic modelling remain on track as we optimize Nano One's innovative process for the commercial production of LFP."

If Pulead and Nano One are successful in jointly developing Nano One's process into Pulead's production lines, then Nano One will likely see a royalty deal struck that will bring millions to Nano One's bottom line. That's the exciting part.

Nano One's proprietary process technology

Process Technology for Lithium-ion Battery Cathodes



The LFP market is a tremendous opportunity for Nano One

LFP will represent a tremendous market opportunity for Nano One with market demand anticipated to double to over 200,000 tonnes/yr in 2025. China has even said that 61% of passenger vehicles and 94% of buses will use LFP batteries. LFP is having a terrific resurgence due to its low cost, safety and stability, beating all other cathode materials in that area. Another reason companies are choosing LFP is that it contains no cobalt. While cobalt may be needed for long range luxury EVs and portable consumer electronics, it isn't needed in LFP battery applications such as buses, grid storage and entry level 200 km EVs, where safety, longevity and cost are more important than range.

Amazon announced they want to bring clean energy to their delivery fleet. Last mile and short-range delivery trucks are also likely to be LFP powered as that is the most cost effective and the safest material. Also in China LFP batteries are almost at cost parity with lead-acid batteries, still one of the largest battery markets. With growing pressure in China and elsewhere to ban lead-acid for its environmental hazards,

LFP could see a big boost from low speed EVs (80 km/hr).

While Nano One continues to work with Pulead on LFP for today's e-buses and e-trucks, the company continues to innovate and address other battery chemistry challenges. Nano One has over 18 companies in its business development and evaluation pipeline, including the 2 already discussed. With such a large and growing pipeline, the company is expected to announce more partnerships later this year, and get investors very excited.

Outperforming global benchmarks in reducing the cost of lithium batteries.

Lithium ion batteries have two electrodes, the anode and the cathode, that transmit lithium ions through an electrolyte. Cathode powders have great potential to change battery performance and also account for a quarter of the cost of a typical battery cell. For batteries the challenge will be reducing the cost of raw materials and processing, while boosting capacity, charge and cycling.

Nano One Materials Corp. (TSXV: NNO) is a Canadian technology company with a scalable industrial process for producing low cost high performance battery materials. Some of the more promising cathode materials being developed in labs are using processes with 50 to 100 steps and production cycles of 4 to 7 days. Nano One's technology can use lower grade raw materials and complete a production cycle in less than a day using a three stage process with up to 75% fewer steps. Nano One believes that cost-effective production of nano-structured

cathode materials can address pent-up global demand for better batteries by reducing costs by up to 50% (\$/kWh); delivering robustly structured cathode materials that last 2-3 times longer, store more energy, and deliver more power. For electric vehicles this could translate into fewer battery cells, less weight, less cost, extended range, longer lifetime, or better warranties. For consumer electronics this could mean greater storage, faster charging or more power.

On September 20, 2018, Dan Blondal, CEO of Nano One announced that their Lithium Iron Phosphate (LFP) cathode material, and the cost of making it, are outperforming global benchmarks and could be a disruptive force in the lithium/iron battery space.

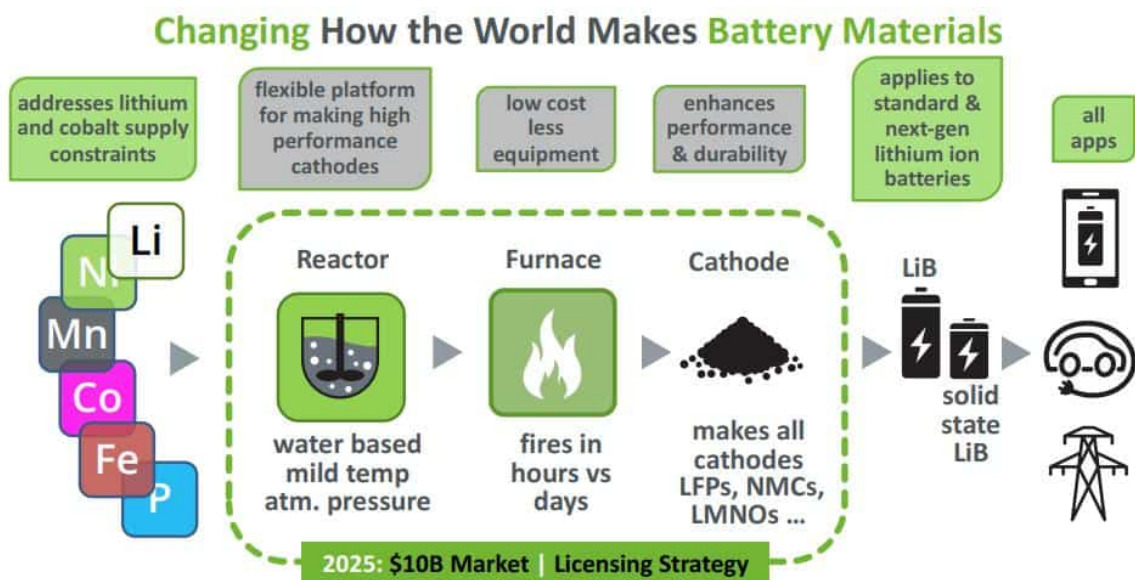
CEO Blondal stated: *“Major cathode producers have begun evaluating our LFP and initial results are consistent with the excellent battery performance we’ve been measuring in our lab. The preliminary economic modeling is also very compelling with LFP production costs conservatively estimated at 10 to 30% below industry standards.”*

By 2025 the global LFP market size is projected to be 130,000 tonnes and worth about \$1.5 billion. To address this opportunity Nano One has developed a proprietary process, using lithium carbonate, which enables lower cost sources of iron and phosphate than those used presently by other LFP producers. Economic modeling of this innovative process delivers capital and operating projections well below current industry costs. This leads to a sizable revenue opportunity that Nano One is evaluating with commercial interests in the lithium ion battery and cathode material space.

LFP is the cobalt-free, high durability, low cost, and safest cathode material of choice for lithium ion batteries. It is used in e-buses, e-bikes, power tools and grid storage systems for renewable energy. As costs come down, LFP may also replace lead acid batteries, further increasing demand.

Nano One Chairman, Paul Matysek added: *“There is a compelling business case with our LFP technology, it is ripe for partnership on full scale production, and this adds to other opportunities Nano One is pursuing to jointly develop solid state batteries and low-cobalt chemistry.”*

Nano One envisions a world where the remarkable properties of nano-materials are no longer impeded by raw material and production costs. The Company’s vision is to establish its patented technology as a leading platform for the global production of a new generation of nano-structured composite materials.



The world is heading into a new evolution in all things electric powered by batteries. E-cars, e-bikes, e-buses e-trains maybe one day even e-planes. Nano One has the technology to lower size and cost of the most important part of this evolution, the battery. One to watch.