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# Battery market solutions

Your partner in revolutionizing the full battery life cycle

**HATCH**





## Your challenges, our solutions

Climate change is one of the most critical challenges facing the world and electrification is an important part of the solution. Battery technologies are central to the battery electric vehicle trend, with manufacturers seeking to secure supplies of critical raw materials for battery cathode production, including lithium, nickel, manganese, and cobalt.

Global demand for battery metals grew by 70% between 2019 and 2020 and is set to grow by 300% over the next decade. However, with a finite supply of battery materials, recycling is critical for sustaining a battery-centric economy. It is an emerging and complex market where innovation, speed-to-market, and capital and operational efficiency are essential.

A growing number of companies are looking for opportunities to enter the battery market. Whether it is developing new markets and verticals, securing supply of materials, expanding processing capabilities, modifying existing flowsheets to expand operations, or building new manufacturing facilities, the challenge can be daunting.

### **We can help.**

We understand the battery market and partner with our clients to offer full-service solutions—from business advisory, to mining and processing battery-grade chemicals, to battery cell manufacturing and application, and finally, to battery recycling. You will get knowledgeable, sound advice and our full support with several essential services.

Our goal is to implement ZERO-EMISSION Gigafactories through Hatch value-add ideas, and expertise in the complete battery value chain.

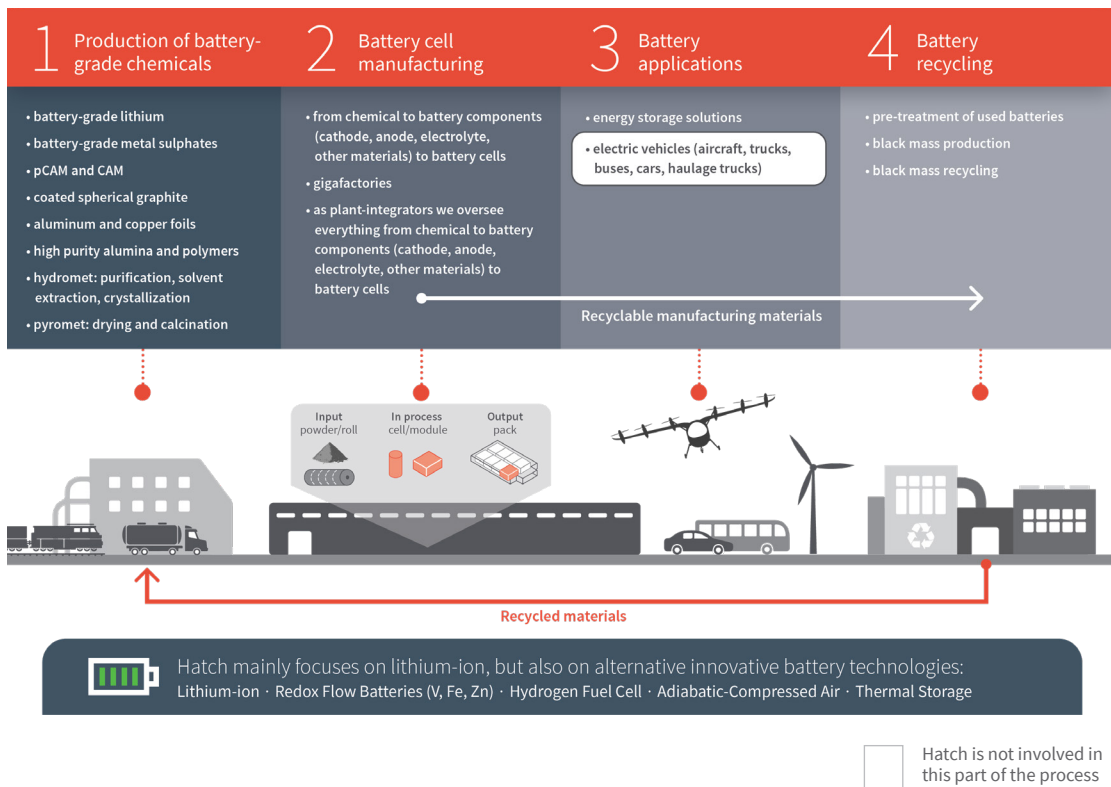


# Your partner for the full battery life cycle

As plant-integrators, we implement our extensive battery chemical, battery cell manufacturing, and project implementation expertise, as well as our innovative technology offerings. We can improve your business case, helping you make informed decisions about entering the battery market.

## Solutions for every stage of the battery life cycle

Battery market solutions (BMS) provides a full range of services and expertise from raw materials through manufacturing and applications to recycling and reuse.



# Essential services, sound strategies

From launching new technologies to optimizing processes, our objective remains the same: to work with you to address your most complex challenges. We offer full-service solutions across the value chain of several battery technologies, including lithium-ion, vanadium redox flow, hydrogen fuel cell, adiabatic-compressed air, and thermal.

## Advisory services

We aspire to unleash the full potential of your assets by helping you complete the right financial transactions and business transitions; developing winning strategies to achieve a competitive advantage in your markets; improving your core processes and systems; and driving the right behaviors throughout your organization.

## Test work and scale-up to commercial capacity

Successful projects rely on test work that's properly interpreted and scaled-up to commercial capacity. You need a partner that specifies and oversees test-work to extract maximum value and inform engineering design. To manage risk, scale-up requires careful consideration of factors related to equipment designs.

## Process development and optimization

Whether manufacturing battery chemicals or cells, you need innovative process design and implementation methods, with thorough process understanding and delivery of value throughout the project life cycle. We are at the forefront of developments in engineering, pilot plants, and the latest in process technology.

## Plant-integration, detail design and project execution

Our experienced engineers use integrated design tools, such as 3D modelling, to allow automation of material take-offs. Our deliverables inform procurement and construction, resulting in industry-best project outcomes.

## Environmental services

We provide a cost-effective assessment-and-management approach that integrates environmental, community, and social matters. From permitting to assessing your ESG performance, we have the support you need.

## Digital transformation

Digitalization is a game changer—an enabler to step changes in safety, productivity, cost efficiency, and performance. To implement a holistic digital transformation, you need concrete operational experience.

## Technology development

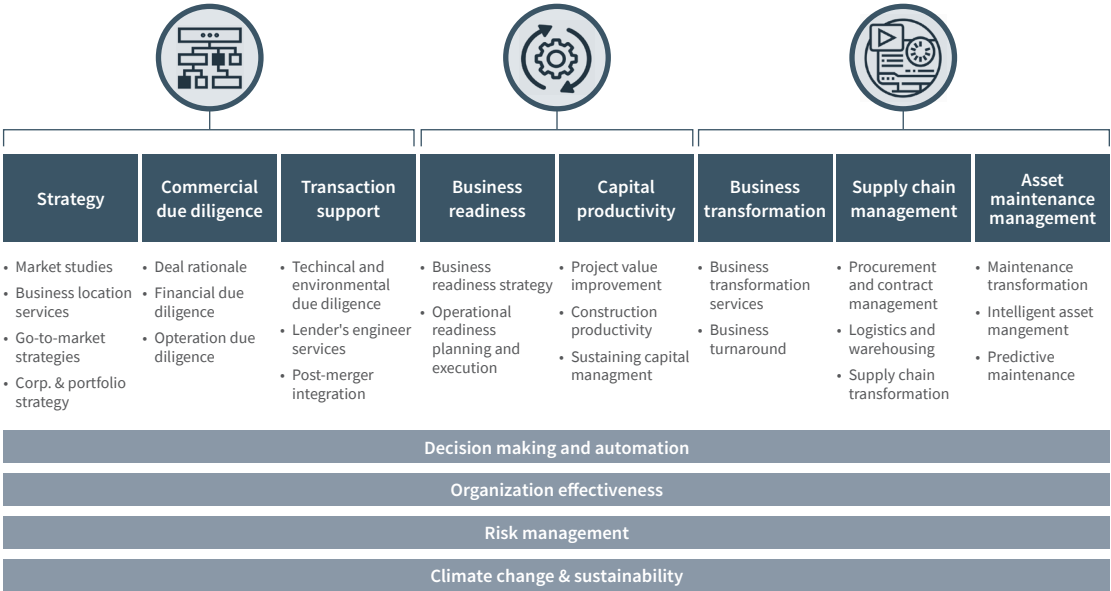
In addition to our existing technology offerings, we work with you to develop new solutions and to add value along the technology developmental path, including full-scale feasibility and intellectual-property considerations.

# Advisory services

We support your journey into the battery market, from entry to ramp-up.

## Hatch advisory services

We offer our clients support across the entire business life cycle.



### Corporate and operations strategy

We help optimize life cycle costs and margins across the full value chain of your operations by identifying critical gaps (technical, operational, capability) and developing a roadmap to address them. Using our technical know-how, we help define your competitive advantage in the battery sector and align a coherent plan to extract superior shareholder value.

### Market studies

We use analytics and expertise to deliver insights that help you understand key battery trends and develop market-facing models that extract the maximum value from the assets of your business.

### Business readiness and execution

We support your battery market entry at the concept stage and help you assess your business needs. Once your battery production play has a solid strategic foundation, we help prepare for operations ramp-up by developing robust scaling and handover plans that allow you to optimize the time to full production capacity.

### Transaction services

By relying on our comprehensive in-house data and our rich technical, environmental, and social reviews, we are able to fully support battery-related mergers and acquisitions, along with investment and divestment decisions, and help you navigate your competitive landscape.



### Sustainability

We help guide your business on its journey to a net zero carbon footprint by helping you find and remove carbon across your battery business system, at all stages of maturity. We work with you to conduct a comprehensive analysis of your systems—from product design and supply chain to battery manufacturing operations—and determine where the carbon is and the best method for removing it. We work alongside you to design and implement operational change and deliver improvements that last.

### Risk management

We help you measure, assess, and develop a robust approach to govern, collect data, mitigate, and respond to strategic risks and monitor compliance across your enterprise life cycle. We follow a holistic approach to assess and tackle catastrophic risk issues, involving technical, digital, and organizational/cultural dimensions.





# Project execution excellence

As plant-integrators, the engineering and construction of successful complex projects require accurate monitoring, forecasting, and management. With new technologies, complex facilities, specialized construction, and large projects, there is pressure for invested capital to generate a quick return.

Project management isn't just about delivering new programs, structures, and operations. It's about finding new ways to improve efficiency, to address larger social issues, and balance short-term gains with long-term forecasts.

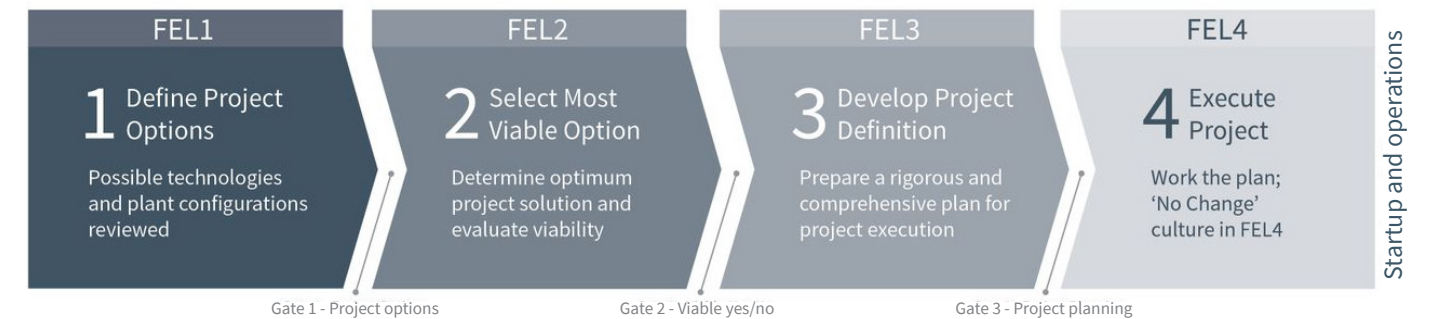
We maintain custom toolsets, systems, and processes to provide full-service capability for all aspects of project design and construction delivery, and continually deliver award-winning projects in some of the world's most difficult environments. Our rich experience and successful commercialization of many “never-been-done” projects enhances our ability to meet or exceed our clients' project execution expectations in the most cost-effective and sustainable manner.

## Project delivery philosophy

- Non-negotiable focus on superior client value, quality work, sustainability solutions, and workplace safety.
- Front-end loading of project definition and development activities with rigorous gate reviews between project phases. This helps clients make informed decisions on their projects from conceptual studies to execution.

- Thorough plant-integration, addressing all plant design interfaces and closing gaps to deliver a complete plant design.
- Commissioning and construction driven projects founded on engineering excellence.
- Innovation in design and execution to meet client business needs.
- Embedded principle of package ownership, across functions, throughout the package life cycle.
- Consistent project delivery approach, execution, and reporting through all phases.
- Timely and honest communication with stakeholders.
- Project delivery inclusive of operational readiness and enabling of ongoing asset life cycle support to client operations.

## Front-end loading framework



## Project life cycle process

We have used a phased approach to execute of major projects for over 30 years. Through continuous improvement efforts and consistent refinement of our approach, we have developed a unique Project Life Cycle Process, which addresses the four major phases of a project: conceptual study, prefeasibility study, feasibility study, and execution. Each phase of the process incorporates planning and procedures that support our goals of zero harm, quality excellence, and reduction of risk. Therefore, from project inception (including research and test work scale-up) to construction, we have a comprehensive capability to support our clients.

## Project and construction execution planning

Projects need a customized project management strategy, built on global expertise and innovative delivery tools, and led by the most experienced project managers in the business. As your partner, we apply “outside-the-box” solutions, tools, and processes such as ConstructSim and Lean tools and working methods. We find ways to limit rework in the field and find savings opportunities. We explore new ways to not only improve project-delivery efficiencies, but to recommend and implement the best strategies to set you up for the future.

## Integrated teams, specialized engineering, and project management solutions

We work closely with our clients to understand the operating challenges they face. Integrated teams propose solutions that take the whole project into consideration from prefeasibility and feasibility studies, design, and construction through commissioning, ramp-up, and operations. Proven processes and tools are combined with innovative new technologies to reduce risk and maximize productivity.

## Engineering, procurement, and construction management (EPCM) delivery approach

Effective management can be achieved through an engineering, procurement, and construction management (EPCM) delivery approach in which all the executing services are integrated and provided through a single service provider. Our in-house integrated systems and tools have been designed specifically for EPCM delivery. They allow for monitoring, reporting, control, and management across the complete spectrum—from a detailed working level to complete roll-up and dashboard reporting.

## Health, safety, and risk management

Safety plans must be developed, reviewed, implemented, and communicated throughout the project life cycle to mitigate risk. Our programs are designed to best fit the culture and location of the project and have consistently maintained industry-best safety performance.

# Global presence, local focus

At the core of our business is our exceptional project management and execution skills. We have a history of successful engagements for highly complex facilities and can leverage our deep knowledge and engineering, procurement, and construction management expertise.



CTR, Hell's Kitchen Geothermal Lithium Plant in California.

## Battery chemical production - lithium

**Hell's Kitchen Geothermal Lithium**  
(a green-lithium project)

**Controlled Thermal Resources | United States**

Since 2018, our team has been helping Controlled Thermal Resources (CTR) develop their integrated lithium-from-geothermal brine project in the Salton Sea, California. The process extracts hot, pressurized geothermal brine from a deep geothermal reservoir, and flashes steam to run a turbine and generate electricity. The brine, which contains many value-metals, including lithium, is conditioned before it is processed in a proprietary Direct Lithium Extraction (DLE) Technology, for recovery of lithium. As part of the project, we have investigated over a dozen DLE technologies from companies such as Lilac, Axion, Koch, Dupont, and Adionics to assist CTR in the selection of the appropriate technology for project economics. The project is highly integrated with geothermal aspects, utilizing both power and steam generated by the process to facilitate lithium production.

## Battery chemical production – metal sulphates

**Northvolt | Sweden**

We have been actively working with Northvolt to establish a cost-effective process to produce battery-grade metal sulfate solutions. This work has been published and a patent filed. The process entails generating a metal sulfate which may be battery-grade or electroplating-grade. Additionally, we have internally developed several improvements to the traditional battery chemical production process, including black mass recycling.

## Advisory services

**Due Diligence | Canada, United States**

We have supported various OEMs who seek to complete market supply and product forecasting studies, to develop their strategies to secure feedstocks, and bolster their supply chain related to the Electric Vehicle Market. As part of their strategies, OEMs have had us help identify potential investment targets within the mining and battery chemicals space, as well as perform technical due diligence to evaluate project maturity, technical risks, and economic robustness of various identified investment targets.

## Battery chemical production – pCAM/CAM

**Nano One Materials Corp. | Canada**

Nano One reported that progress on their cathode material evaluation program with a multinational automotive company, announced last year, has led to an expansion of the project. The expanded collaboration will evaluate economic and environmental advantages of Nano One's process technologies to produce nickel-rich cathode materials to supply a full-scale automotive battery cell assembly plant. We have been engaged by Nano One to lead an engineering study and provide a report to the automotive company. We will lead a process comparison, optimization, and scale-up study. This study will form the basis of an engineering cost model report and will include a Front-End Loading level 1 (FEL1) analysis on capital costs, operating costs, and a cost comparison of the Nano One process versus the conventional cathode material manufacturing process.



## Battery cells

**Confidential clients and locations**

Hatch is helping several clients, reviewing their giga-factory development plans and providing guidance on piloting and demonstration strategies as they embark on their building journey. This includes project planning, layout support, and tool package definition. On certain assignments, Hatch has provided guidance on tool selection.

## Battery recycling

**Li-Cycle Holdings Corp. | United States**

We have been engaged by Li-Cycle, a North American leader in lithium-ion battery resource recovery, to support the construction of its first commercial Hub facility being developed near Rochester, New York. Li-Cycle will increase the input processing capacity of HubOne by over 40% annually to meet the growing demand for lithium-ion battery recycling. We will provide engineering, procurement, and construction management (EPCM) services. The project will construct a facility to process recycled cathode and anode materials into battery-grade end-products for reuse in lithium-ion battery production. This will be the first commercial hub in North America and is anticipated to operate at a capacity of 35,000 tonnes per annum (tpa) of input dry black mass, which is equivalent to approximately 90,000 tpa of LIB (lithium-ion battery) equivalent.



## About Hatch

Whatever our clients envision, our engineers can design and build. With over six decades of business and technical experience in the mining, energy, and infrastructure sectors, we know your business and understand that your challenges are changing rapidly.

We respond quickly with solutions that are smarter, more efficient, and innovative. We draw upon our 9,000 staff with experience in over 150 countries to challenge the status quo and create positive change for our clients, our employees, and the communities we serve.

[hatch.com](https://hatch.com)

**We can provide a full range of services across the battery value chain.  
Contact us to find out more.**

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