



# Manganese is Electric!

(The forgotten battery raw material.)



GREEN AND EUROPEAN SOURCE OF ULTRA HIGH-PURITY MANGANESE



**Euro  
Manganese  
Inc.**

**GREEN AND EUROPEAN SOURCE OF  
ULTRA HIGH-PURITY MANGANESE**

**AABC Europe – January 15<sup>th</sup> 2020**

# Cautionary Note

## Forward-Looking Statements and Risks Notice

Except for statements of historical fact relating to the Euro Manganese Inc. (“EMI” or the “Company”), certain information contained in this presentation constitutes forward-looking statements. When we discuss our costs and timing of current and proposed evaluation; planning; development; capital expenditures; cash flow; working capital requirements; and the requirement for additional capital; operations; revenue; margins and earnings; future prices of electrolytic manganese metal, manganese sulphate and other products; future foreign currency exchange rates; future accounting changes; future prices for marketable securities; future resolution of contingent liabilities; or other things that have not yet happened in this review, we are making statements considered to be forward-looking information or forward-looking statements under Canadian law. We refer to them in this review as forward-looking information.

The forward-looking information typically includes words and phrases about the future, such as: plan, expect, forecast, intend, anticipate, estimate, budget, scheduled, believe, may, could, would, should, might, and will. We can give no assurance that the forward-looking information will prove to be accurate. It is based on a number of assumptions management believes to be reasonable, including but not limited to the continued operation of the Company’s exploration, evaluation and development activities, no material adverse change in the market price of commodities and exchange rates, and such other assumptions and factors as set out herein.

It is also subject to risks associated with our business, including but not limited to: risks inherent in the mineral exploration and evaluation and mineral extraction business; commodity price fluctuations and hedging; competition for mineral properties; mineral resources and reserves and recovery estimates; currency fluctuations; interest rate risk; financing risk; environmental risk; foreign activities; legal proceedings; and other risks.

If our assumptions prove to be incorrect or risks materialize, our actual results and events may vary materially and adversely from what we currently expect as set out in this review.

Forward-looking information is designed to help you understand management’s current views of our near and longer-term prospects, and it is not appropriate for other purposes. We will not necessarily update this information unless we are required to by law.



# Introduction to Euro Manganese

- **Developing the Chvaletice manganese resource in the heart of Europe in the Czech Republic**
  - **25-Year project** designed by world-leaders in high-purity manganese production (“**HPM**”)
- **Recovering manganese by reprocessing tailings (waste recycling) makes Chvaletice manganese products environmentally-superior**
  - No hard rock mining, crushing or milling required.  
**No new waste**
  - **Manganese carbonate ore** allows direct leach, so no calcination or chemical reduction is required prior to leaching .
- **Extensive metallurgical test work completed with modern, conventional, proven process technology**
- **Pilot-plant tests completed and ready to build Demonstration Plant**
- **Solid permitting momentum, proactive, respectful and intensive community engagement**
- **Upon commissioning will be Europe’s only primary producer of HPM products**



*EMN executives, Thomas Glück and Jan Votava, inspecting Chvaletice bulk sample preparation at CRIMM R&D Center in Changsha, China.*

# Project Highlights



## 1 HPM MARKET SET TO BE TRANSFORMED

- HPM demand growing rapidly on back of growth in the Li-ion and EV markets
- Significant barriers of entry to HPM, where not all manganese ores and HPM are created equal
- Mn used in the vast majority of Li-ion batteries, with low substitution risk

## 2 STRATEGIC EUROPEAN SOURCE OF SUPPLY

- Globally significant 25 year project which will be Europe's only primary producer of High Purity Electrolytic Manganese Metal ("HPEMM") and High Purity Manganese Sulphate Monohydrate ("HPMSM")
- Located in the heart of Europe's fast growing EV production hub
- Strategic supplier in a market where China controls 98% and 90% of Electrolytic Manganese Metal ("EMM") and HPMSM capacity, respectively

## 3 EXCELLENT INFRASTRUCTURE AND JURISDICTION

- Rail, highway, gas pipeline, water and competitively-priced power available on-site
- Rights to industrially-zoned land adjacent to deposit secured for plant
- Sophisticated, stable and business-friendly European Union jurisdiction in the Czech Republic

## 4 EASILY TREATED CARBONATE TAILINGS

- Uniform and fully drilled deposit very well suited to production of HPM using clean, modern and commercially proven technologies
- Carbonate ore and tailings deposit provide significant processing cost and environmental advantages over oxide ore
- Pilot plant products exceed ultra-high purity benchmarks demanded by the most demanding high-tech customers

## 5 WASTE RECYCLING, NOT MINING

- Recycling of old mine waste and remediation of polluted site, solving a problem for local community
- Preliminary mining permit received in 2018, with solid permitting momentum
- Opportunity to purchase 100% green power

## 6 CLEAR DEVELOPMENT PLAN

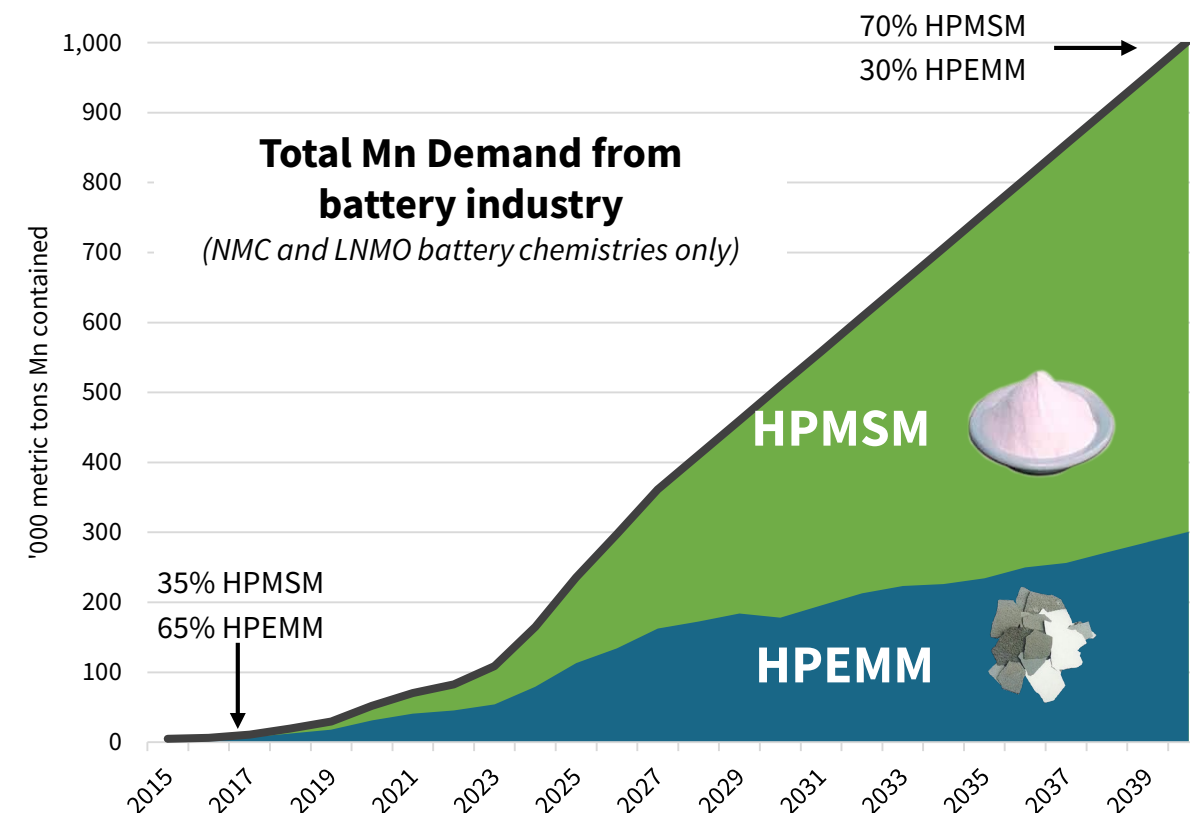
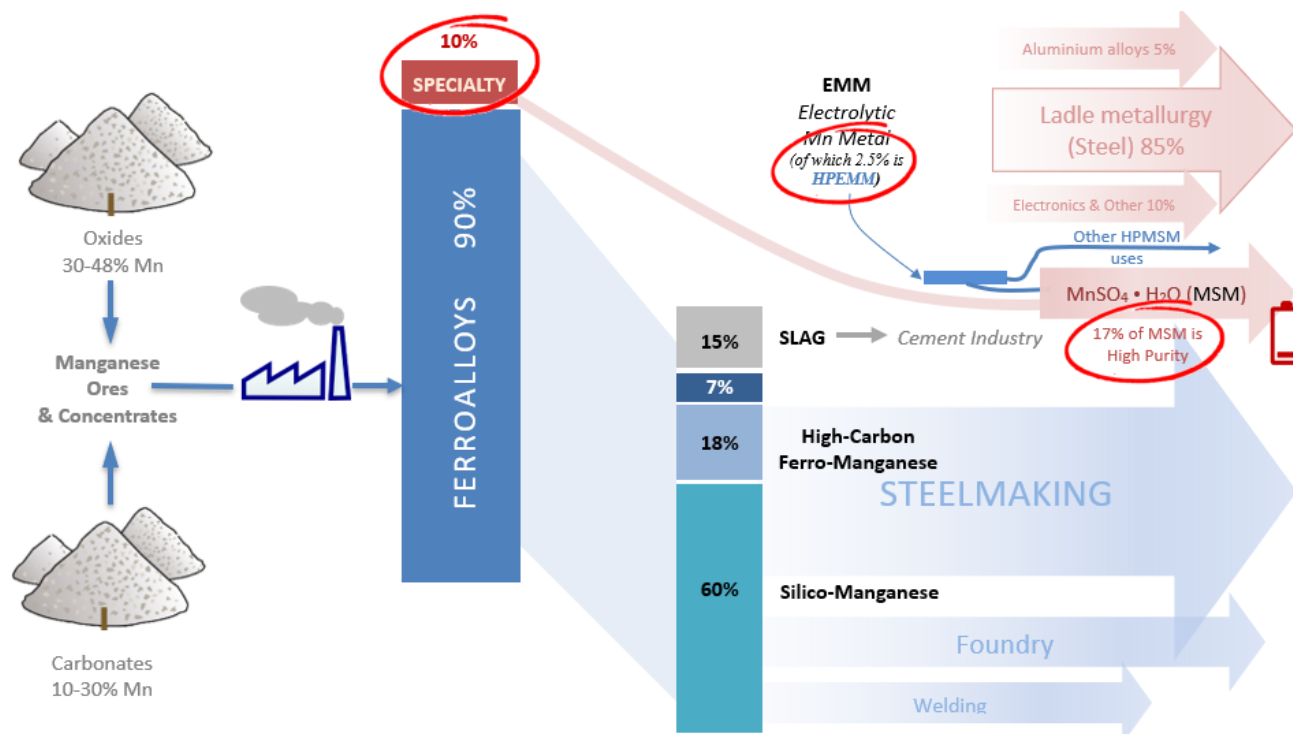
- Pilot plant confirmed ultra-high purity nature of product
- Feasibility study in progress and building upon PEA issued in early 2019
- Strong customer interest for demonstration plant to be built in 2020

## 7 LED BY HIGHLY EXPERIENCED MANAGEMENT TEAM

- Solid multidisciplinary team with proven development track record and excellence in environmental and social practices
- Rare in-house HPM production experience
  - "God is in the details"
- World-leading HPM plant design and construction expertise and technology secured
- Management team and directors are significant shareholders

# 1 HPM Market Set to be Transformed

## Manganese Use in Li-ion Battery Market



- Only a small proportion of manganese ores are used for the specialty route
  - Critical factor is availability of right quality ore in right location
  - Carbonate ores (which are rare) are preferred for HPM, although oxides can be used after roasting or chemical treatment (making oxides more expensive to process, energy intensive and much less environmentally friendly)
- Li-ion cathode manufacturers and NMC precursor producers purchase HPMSM that has been made directly from manganese ore or from EMM, or they purchase high-purity EMM in order to make their own HP manganese sulfate
- The primary cathode chemistries in 2040 will be NMC and LNMO, requiring manganese input of the over one million tonnes of manganese metal equivalent per annum

Source: Cairn Energy Research Advisors, CPM Group ©2019

# 1 HPM Market Set to be Transformed

## Summary

- **Demand for HPM products growing rapidly around the world** driven by growth of the electric vehicle and Li-ion battery industry
  - To date, the supply response has been entirely within China
- **NMC cathode chemistry expected to dominate**, with strong future market opportunity for solid-state batteries
- **Under-investment in necessary HPM production capacity is acute**, and widely expected to cause supply deficits in near to medium term
- **Europe has emerged as a major electric vehicle production hub**
  - Over € 24 billion in investments in European electrical vehicle, battery, cathode and precursor plants underway – much more to come
- High-purity manganese products are difficult to produce consistently without high processing costs or significant adverse environmental impacts
- **Automotive and battery industry requires a reliable and verifiable supply of high-purity and sustainably-produced manganese products**
- Processing manganese carbonate ore is more **reliable and environmentally sustainable** vs manganese oxide ore

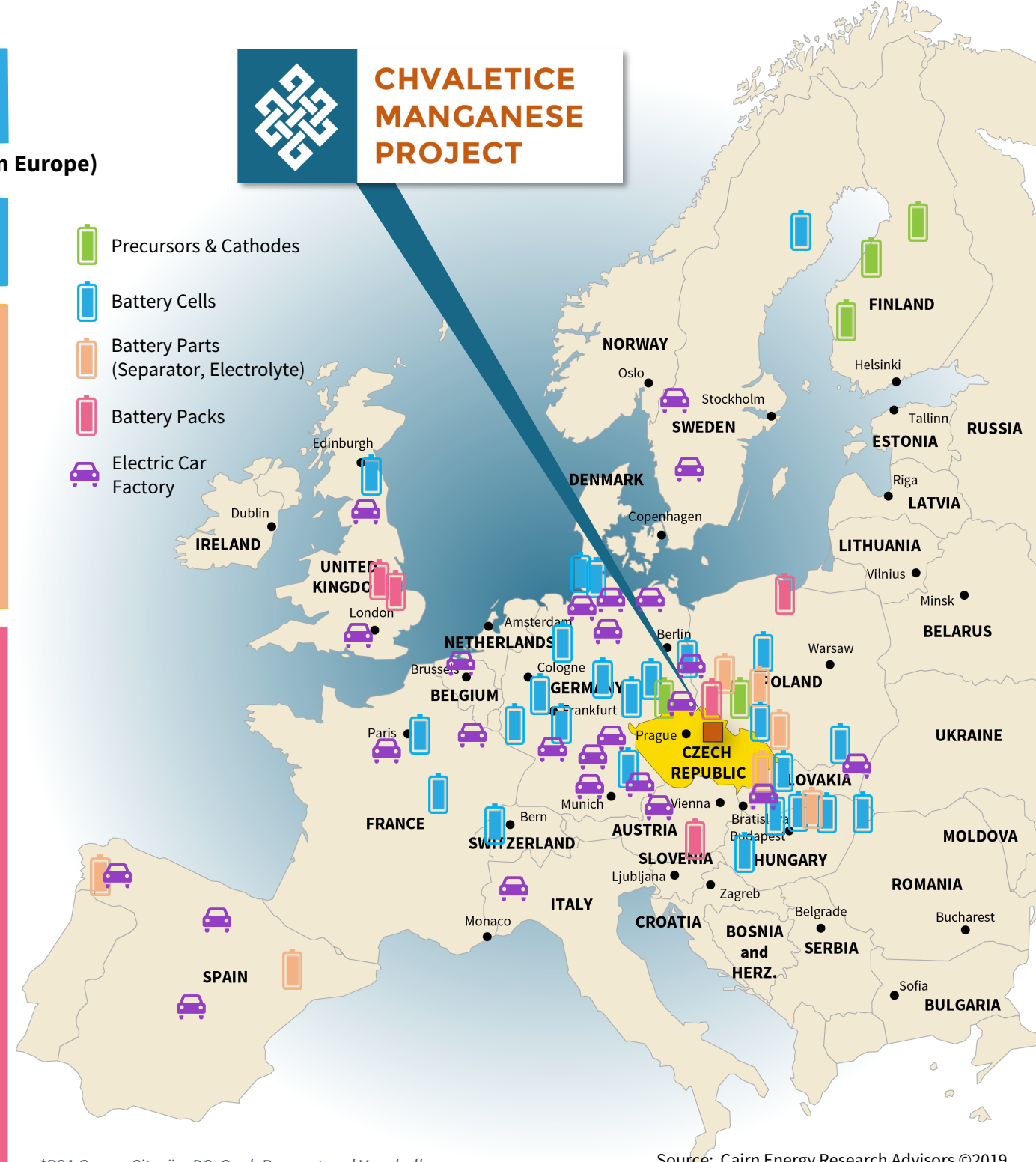


# 2 Strategic European Source of Supply

Europe is becoming a global hub for EV and battery production

<b>BASF</b>	<b>FINLAND</b> ~15 GWh	<b>inoBat</b>	<b>SLOVAKIA</b> 10 GWh	<b>SAFT</b>	<b>GERMANY</b> 32 GWh
<b>Terafame</b>	<b>FINLAND</b>	<b>Leclanché</b>	<b>SWITZERLAND</b> 1 GWh	<b>BYD</b>	<b>TBD (Eastern Europe)</b> 24 GWh
<b>umicore</b>	<b>FINLAND</b>	<b>SAFT</b>	<b>FRANCE</b> 2 GWh	<b>SVOLT</b>	<b>TBD</b>
<b>BASF</b>	<b>GERMANY</b>	<b>SAFT</b>	<b>FRANCE</b> 32 GWh	<b>SK innovation</b>	<b>POLAND</b>
<b>umicore</b>	<b>POLAND</b> ~30 GWh	<b>SAFT</b>	<b>FRANCE</b> 32 GWh	<b>HUA RONG</b>	<b>POLAND</b>
<b>northvolt</b>	<b>SWEDEN</b> 32 GWh	<b>CATL</b>	<b>GERMANY</b> 60 GWh	<b>FOOSUNG</b>	<b>POLAND</b>
<b>Envision AESC</b>	<b>UNITED KINGDOM</b> 8 GWh	<b>northvolt</b>	<b>GERMANY</b> 30 GWh	<b>TORAY</b>	<b>HUNGARY</b>
<b>LG 화학</b>	<b>POLAND</b> 17 GWh	<b>VW</b>	<b>GERMANY</b> 10 GWh	<b>northvolt</b>	<b>POLAND</b>
<b>Johnson Matthey</b>	<b>POLAND</b> ~30 GWh	<b>FARASIS</b>	<b>GERMANY</b> 10 GWh	<b>Daimler</b>	<b>POLAND</b>
<b>SK innovation</b>	<b>HUNGARY</b> 7.5 GWh	<b>Blackstone Resources</b>	<b>GERMANY</b>	<b>SAMSUNG SAMSUNG SDI</b>	<b>AUSTRIA</b>
<b>SK innovation</b>	<b>HUNGARY</b> 7.5 GWh	<b>Customcells</b>	<b>GERMANY</b> 1 GWh	<b>Jaguar LAND-ROVER</b>	<b>UNITED KINGDOM</b>
<b>SAMSUNG SAMSUNG SDI</b>	<b>HUNGARY</b> 3 GWh	<b>LIACON</b>	<b>GERMANY</b> 1 GWh	<b>Hyperbat</b>	<b>UNITED KINGDOM</b>
<b>GSYUASA</b>	<b>HUNGARY</b>	<b>VARTA</b>	<b>GERMANY</b> 1 GWh	<b>PSA GROUPE</b>	<b>SPAIN</b>
		<b>TERRAE</b>	<b>GERMANY</b> 34 GWh	<b>PSA GROUPE</b>	<b>SPAIN</b>
		<b>TESLA</b>	<b>GERMANY</b> ~20-40 GWh	<b>PSA GROUPE</b>	<b>SLOVAKIA</b>

## CHVALETICE MANGANESE PROJECT



\*PSA Group: Citroën, DS, Opel, Peugeot and Vauxhall

Source: Cairn Energy Research Advisors ©2019



# 3 Excellent Infrastructure and Jurisdiction

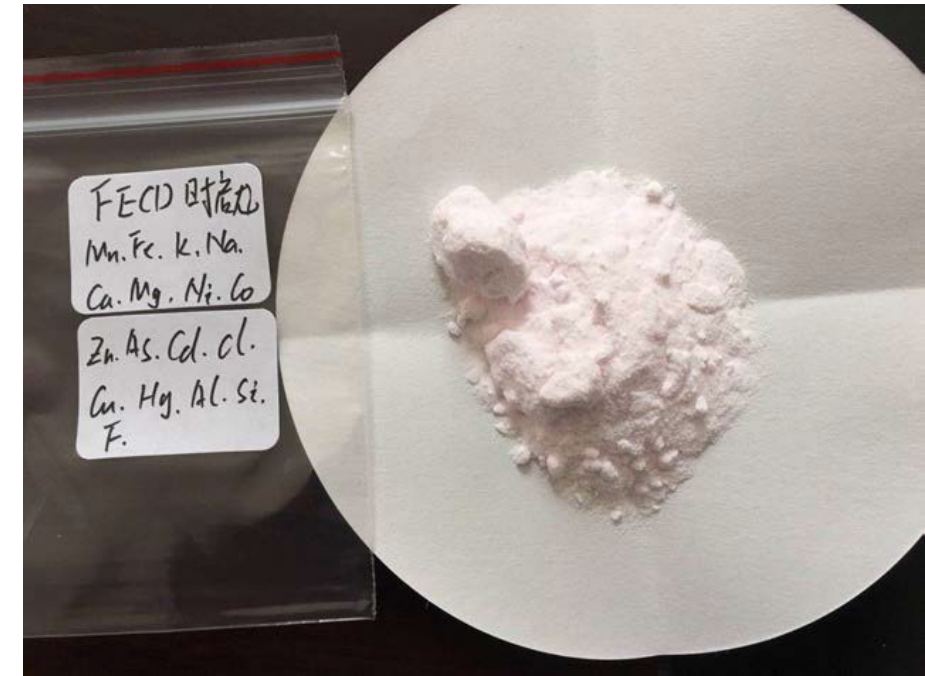
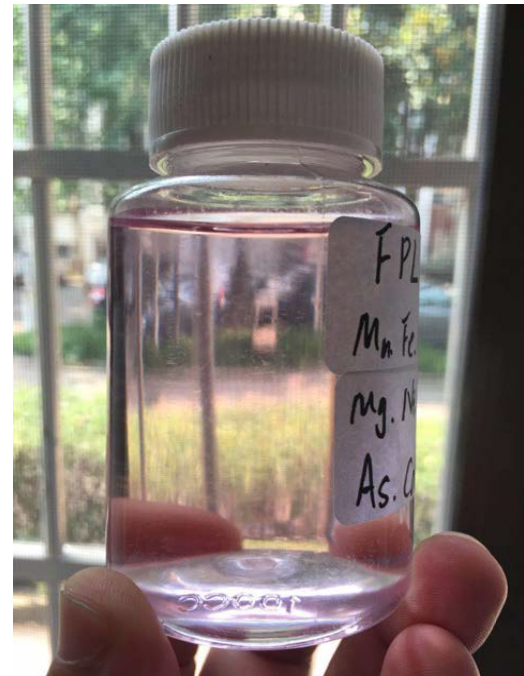
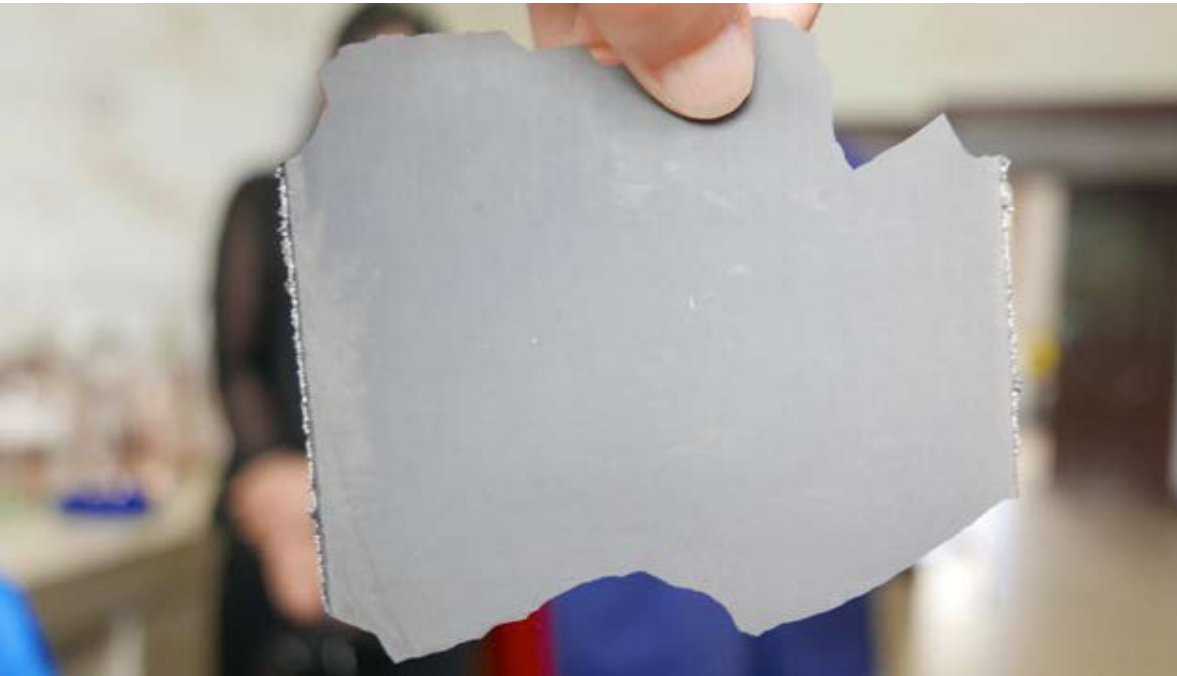
## Strategically Located in the Heart of Europe

- Set in an industrialized valley with gentle topography, served by excellent infrastructure. **Rail, gas, water and power are all available on the Project site**
- Adjacent to 820 MW power station at a major node in the Czech Republic's modern electrical distribution grid, ensuring **competitively-priced power**
- The **Czech Republic is a modern, industrialized free market economy** with a highly-skilled and educated workforce, and a member of the European Union. Corporate tax rate is 19%
- Potential for Czech and EU green direct **investment and innovation incentives**



# 4 Easily Treated Carbonate Tailings

## Barriers to Entry in the HPM Market



↑ Photos show ultra high purity manganese products made from Chvaletice Manganese Project tailings during 2018 product development and testwork program.

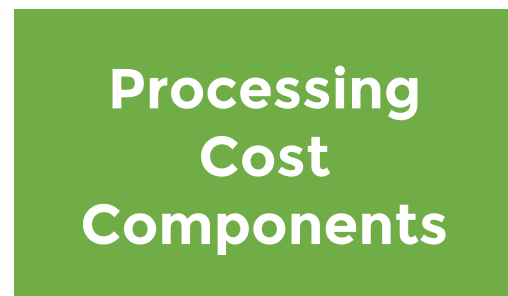
- Ultra-high-purity manganese products have emerged as **critical raw materials** for new, high-performance, low-cobalt Li-ion battery manufacturing; they are difficult to produce
- Technical specifications for manganese products are tightening for **demanding new battery formulations**
- Producing ultra-high-purity manganese for new generation batteries is principally a **processing cost and environmental challenge**
- Product purity is critical. **Very significant resource quality, technological and environmental barriers to entry**
- **Very few manganese deposits are well-suited to efficient, environmentally-sustainable production of high-performance, Li-ion battery-grade manganese products**

Source: Cairn Energy Research Advisors, CPM Group ©2019

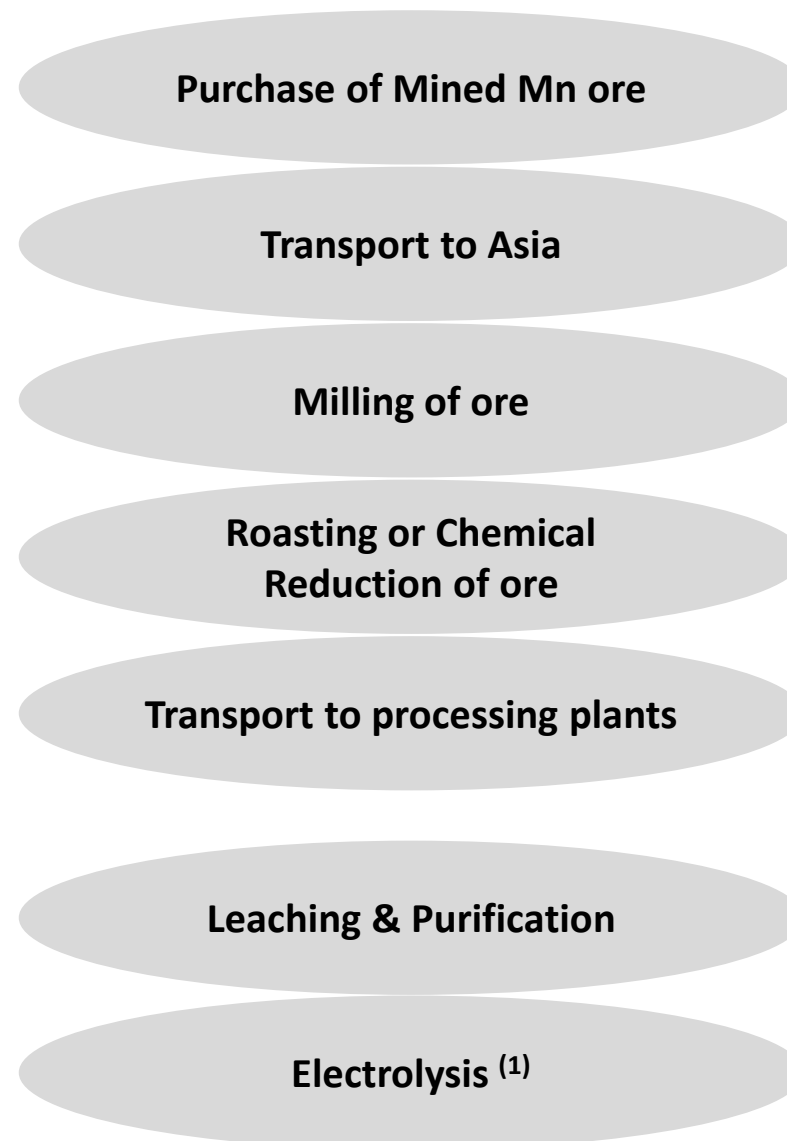
# 4 Easily Treated Carbonate Tailings

## Simpler Cost-Effective Processing

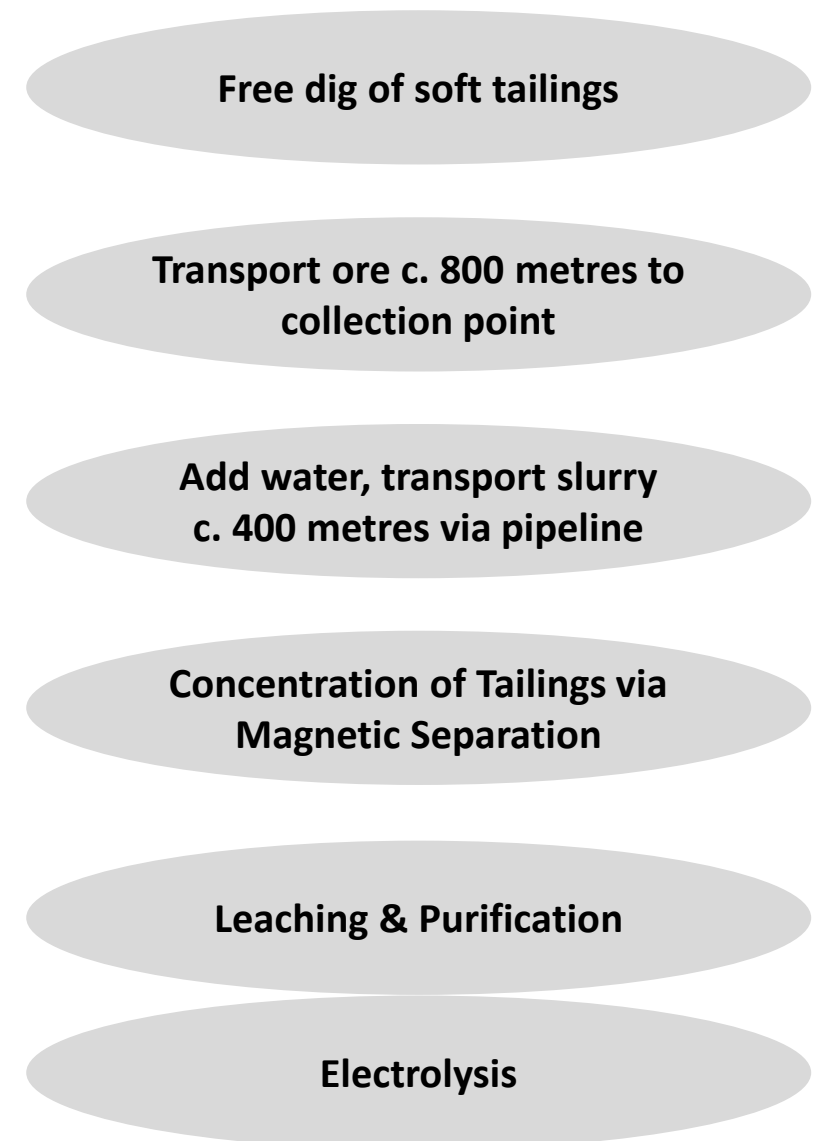
- Asia imports the majority of its manganese ore, predominantly from oxide sources in Africa
- In comparison, EMN processes carbonate tailings onsite with simple commercially proven technologies.



### Conceptual Asian Producer



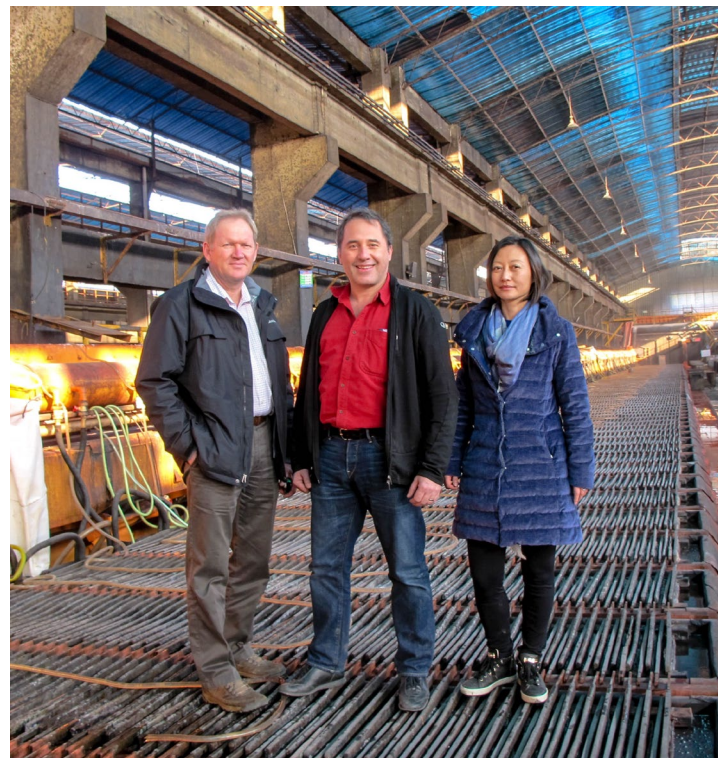
### Chvaletice



1) Asia has higher electricity costs, although lower full-time equivalent labour costs

# 4 Easily Treated Carbonate Tailings

Extensive Technical Studies and Testwork



# 4 Easily Treated Carbonate Tailings

## Drilling & Bulk Sampling



↑ Sonic drill – modern, effective sampling tool



↑ Sonic drill “core” of soft, sandy tailings material

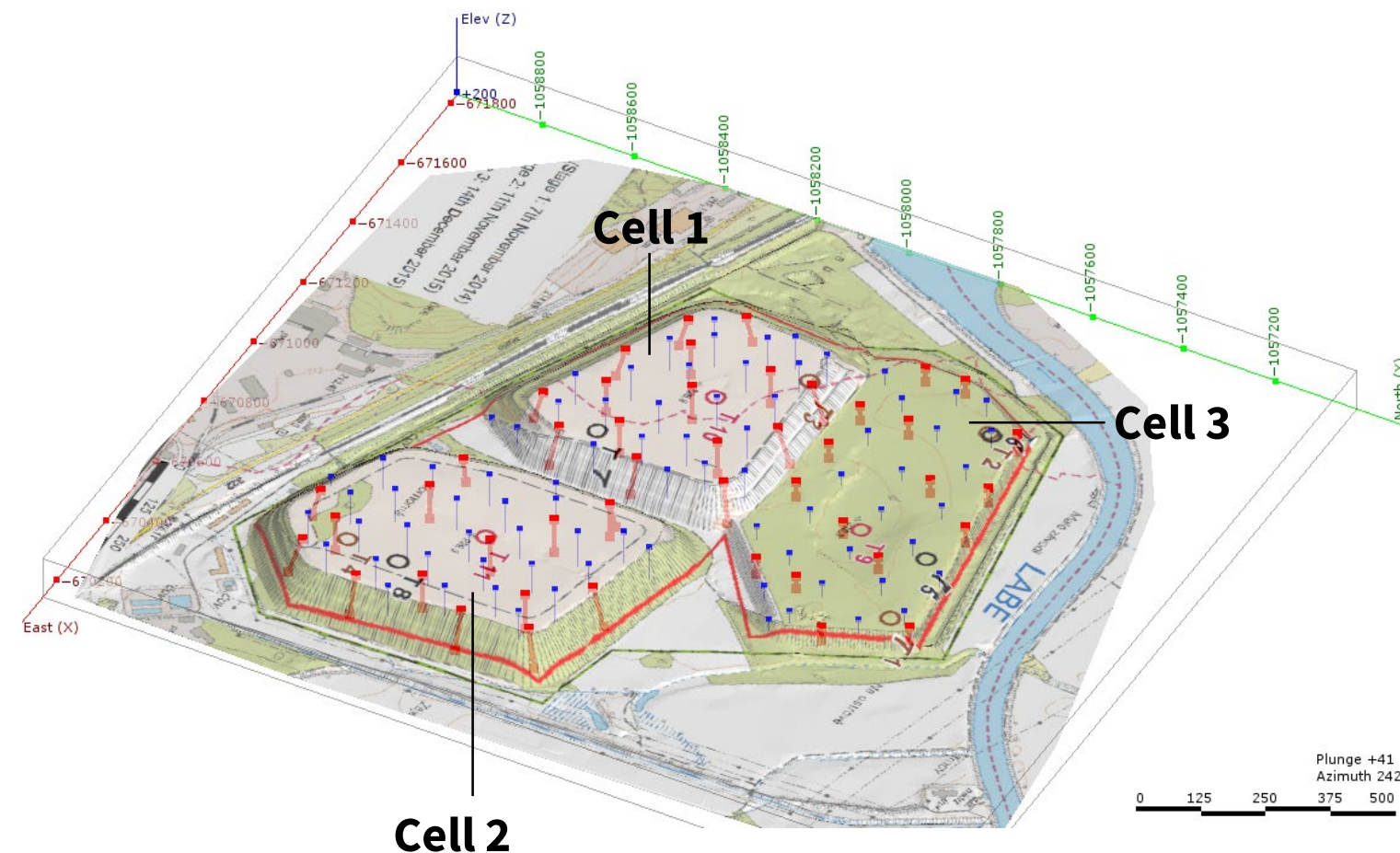


↑ 14.8 tonne bulk sample collected using Sonic drill for metallurgical and pilot plant testing

# 4 Easily Treated Carbonate Tailings

## Fully Drilled Ore Body

### 2017-2018 DRILL PROGRAM



- 160-Hole 2017-2018 Sonic and auger drill program upgraded the resource estimate to a Measured and Indicated Status (**98.3% of the resource classified as Measured under NI 43:101/JORC 2012**)
- Resource model forms reliable basis for tailings extraction plan and robust project economics
- Representative bulk samples collected with drill rig supported extensive 2018/2019 metallurgical testwork and process design studies
- Test mining program planned for 2020 in the context of Demonstration Plant development

# 5 Waste Recycling, Not Mining

## Meeting Europe's Circular Economy Goals by Recycling Waste

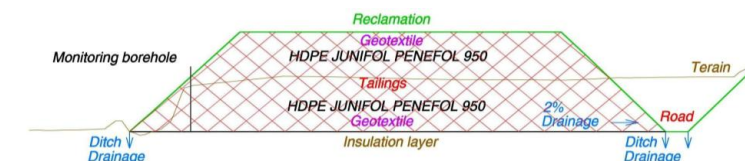
- Extraction of Chvaletice manganese is expected to result in self-funding environmental remediation of the Chvaletice site, bringing it in full compliance with all Czech and European Union health, safety and environmental standards and regulations

### Staged Tailings Extraction

- Tailings extracted in phases, cell-by-cell, then placed back on same site
  - **No significant new waste generation**
  - Small footprint of tailings exposed at any given time

### Progressive Site Reclamation

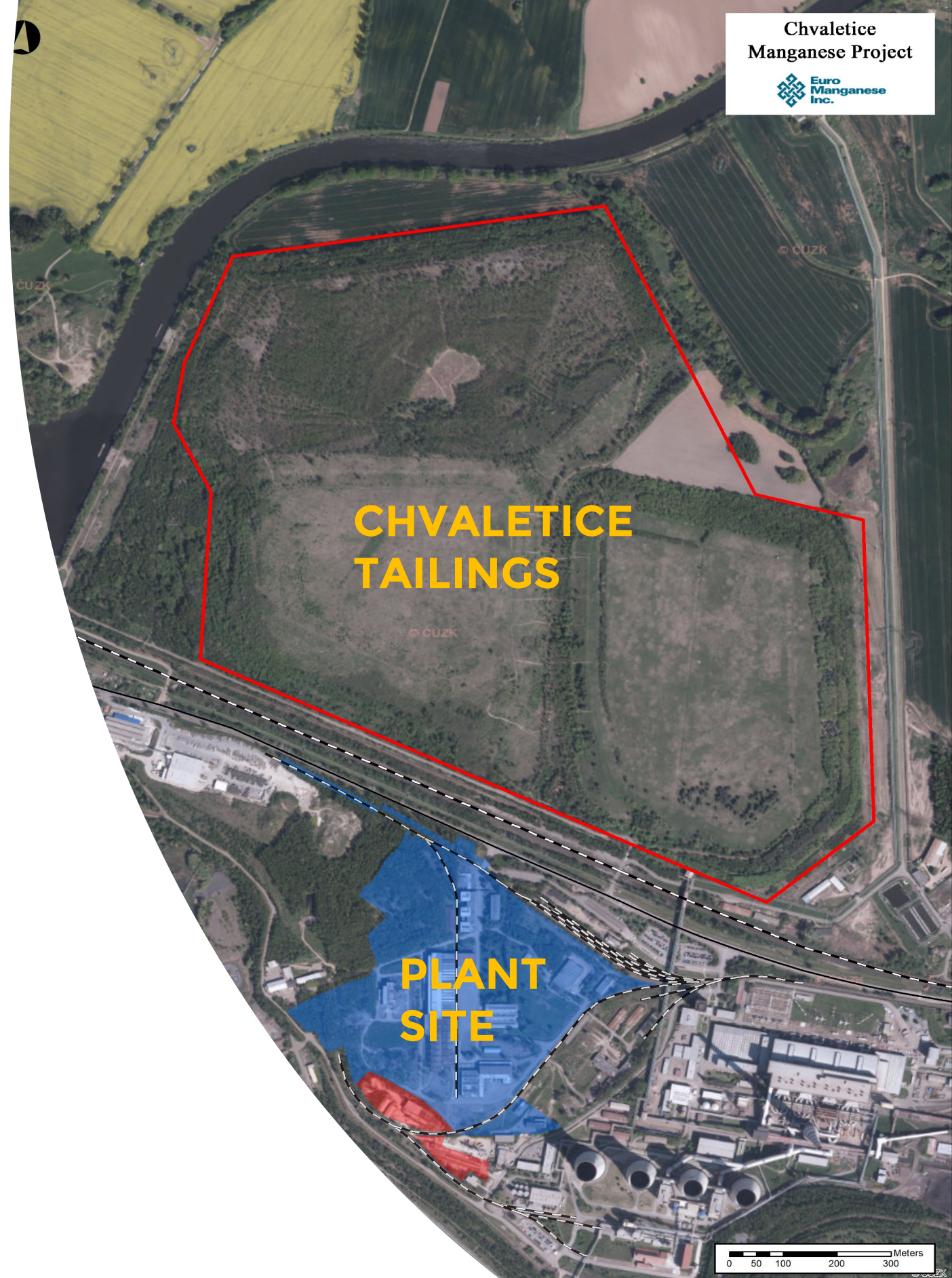
- After Mn extraction, **tailings to be washed and neutralized**, placed on impermeable membrane, then capped with geomembrane, before site revegetation for long-term, safe and productive use. Reclamation plan is being designed with **community input**
- Site restoration and long-term usage plan to be designed in collaboration with local communities and regulators
- Minimizing environmental footprint and leaving site in better condition than it is today  
**A major collateral benefit to local communities and the country**



# 5 Waste Recycling, Not Mining

## Permitting Momentum and Plant Site Land Secured

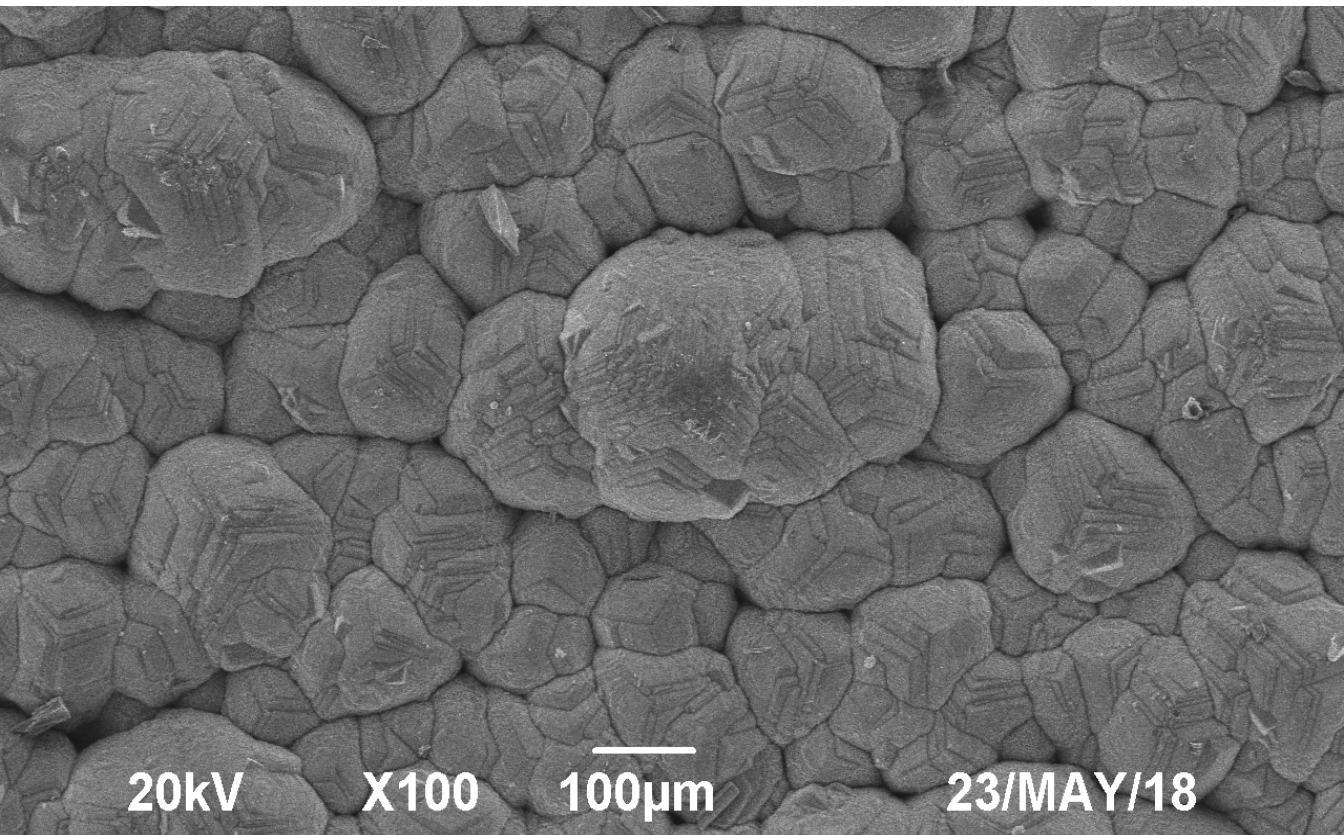
- Baseline environmental studies completed. EIA preparation initiated with Q2 2020 Project Notification submission targeted
- Rezoning process initiated. **Both adjoining municipalities voted unanimously to proceed with land-use plan change**
- Intensive community consultation ongoing. **Overwhelmingly positive feedback and reaction to project**
- Closed option in 2018 to acquire 100% of Czech company that owns 19.94 hectares of strategically-located land (Shaded blue on map), with payments spread over up to 5-years, and tied to permitting progress milestones. Additional parcels of land secured in 2018 and 2019, including one from the adjoining village of Trnavka
  - Plant site land already zoned for industrial use
  - Onsite infrastructure: Two rail spurs and sidings, highway access, gas, water and electrical energy
  - Located less than 200 metres from Chvaletice tailings
  - Adjacent to 820 MW power plant, as well as ready-mix concrete and pre-cast concrete plants





# 6 Clear Development Plan

## Pre-Feasibility Study Level Test Work Program



# 6 Clear Development Plan

## Target Project Development Timeline

### RECENT MILESTONES

### NEAR TERM MILESTONES

2018

2019

2020/2021

2023

- ✓ Upgrade resource estimate to NI 43-101 Measured and Indicated status
- ✓ Pilot scale metallurgical testwork, process design and optimization studies
- ✓ Confirm ability to produce ultra-high-purity EMM and MSM, meeting highest customer specifications for low-cobalt and high-nickel EV battery formulations
- ✓ Determine target products and specifications for modeling in PEA and Feasibility Study (HPEMM and HPMSM)
- ✓ Plant site selection and plant site land acquisition
- ✓ Complete environmental baseline studies
- ✓ Intensifying community engagement
- ✓ Product specification development

- ✓ Complete NI-43-101/JORC Code Preliminary Economic Assessment (for both HPEMM and HPMSM production)
- ✓ Initiate EIA notification preparation process for filing in Q2-2020
- ✓ Design demonstration plant (DP) to produce bulk samples of finished manganese products in Czech Republic for customer testing and qualification
- Organizational development
- ✓ Initial DP MoUs and first steps towards offtake agreements
- ✓ Trigger rezoning process – community votes unanimous
- Intensive, ongoing community consultation

- ➔ Build and commission Demonstration Plant + start of qualification process
- ➔ Complete land acquisition
- ➔ Complete project Life Cycle Assessment (LCA)
- ➔ Completion of EIA and permitting process
- ➔ Complete feasibility study
- ➔ Detailed engineering
- ➔ Additional MoUs and offtake agreements
- ➔ Project financing
- ➔ Initiate Construction

- ➔ Start-up, commissioning and commercial production

# 6 Clear Development Plan

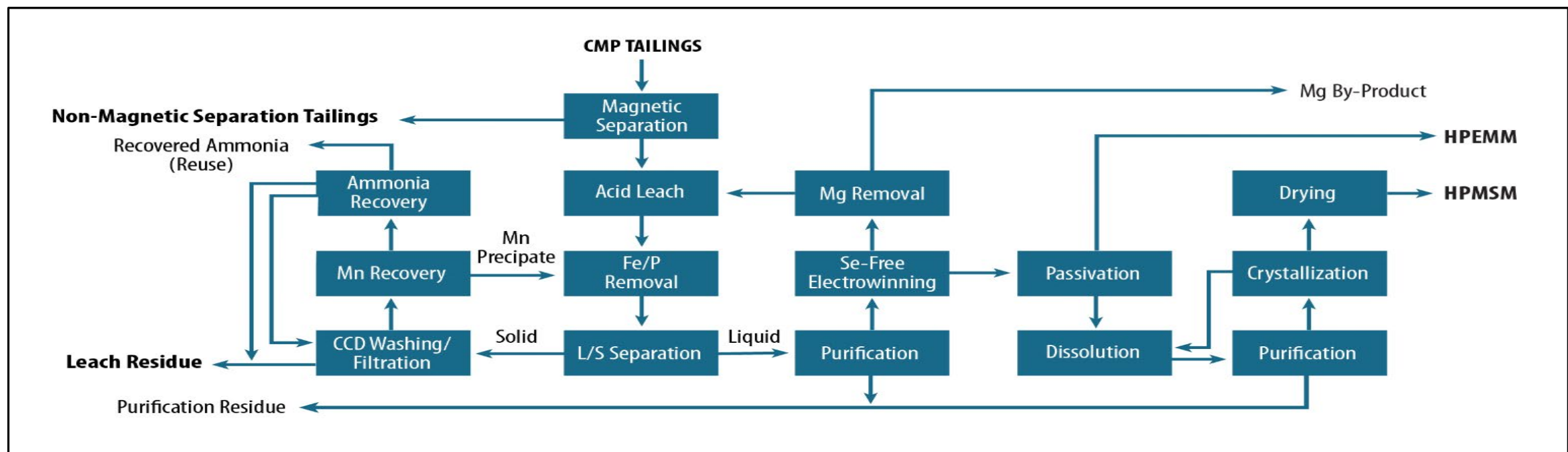
## Feasibility Study

- Feasibility Study initiated in 2019 based on process flowsheet developed during scoping and pre-feasibility study programs conducted during 2017 and 2018. **Feasibility Study completion scheduled for H2 2020**
- Feasibility Study based on pilot plant process flowsheet that successfully confirmed amenability of Chvaletice carbonate ore to low-cost and low-environmental impact **production of exceptional purity manganese products meeting demanding battery industry customer specifications**
- Process stability and reliability are achieved by producing electrolytical manganese metal and converting it to manganese sulphate. Both are **proven, commercial processes**
- Process flowsheet is selenium and chromium-free, assuring **exceptional environmental performance and full compliance with Czech and European Union environmental standards**

## Highly experienced Feasibility Study contributors:

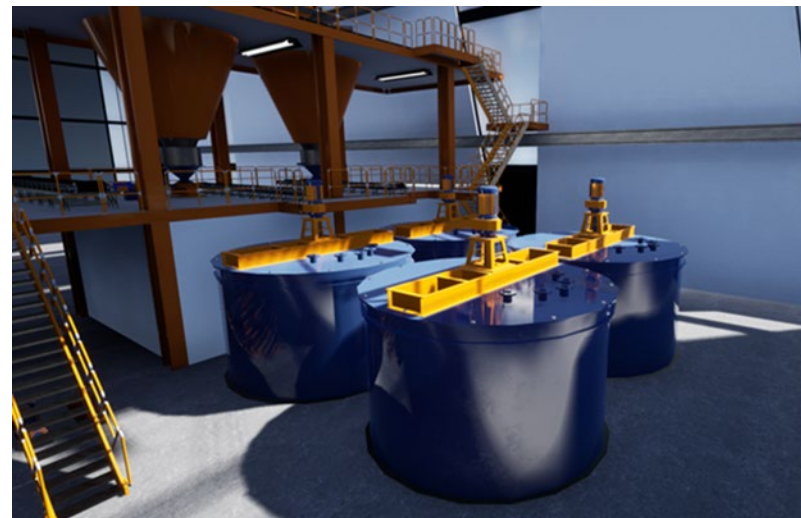
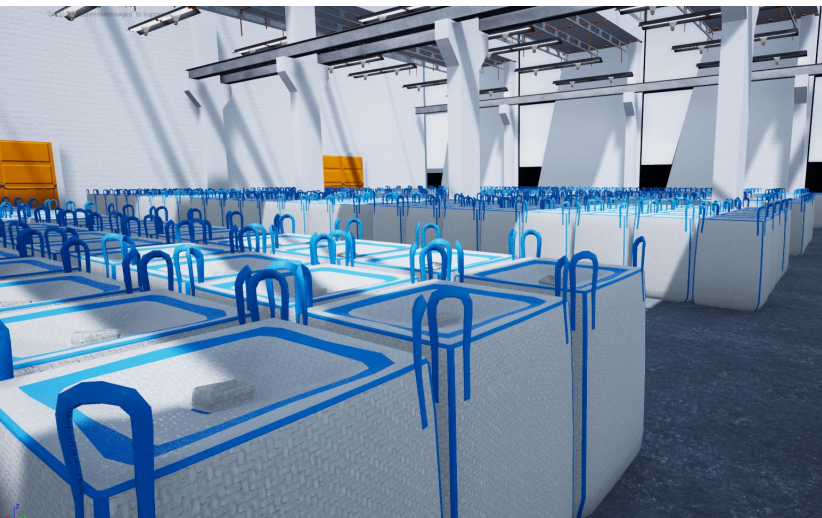
- Tetra Tech Canada – Owner’s Engineer, studies coordination, economics and Feasibility Study Qualified Person (QP) under NI 43:101 and JORC 2012 Code
- Beijing General Research Institute for Mining and Metallurgy (BGRIMM) – Process plant design, process optimization
- Tractebel Czech Republic – Localization studies, including cost estimation, compliance with Czech and EU regulations and codes
- GET sro. – Tailings extraction, dry stacking and site reclamation
- Bilfinger Tebodin – Environmental

## Conventional Process Flowsheet



# 6 Clear Development Plan

## Preliminary Chvaletice Plant Design



## 6 Clear Development Plan

### Demonstration Plant: Key Next Step

- **Demonstration Plant (DP) is key element** of EMN's Chvaletice development strategy
- **Lumpsum, turnkey EPC contract** for DP awarded to CRIMM (Changsha Research Institute of Mining and Metallurgy, a division of China Minmetals Corporation) in December 2019; commissioning scheduled for Q4 2020
- CRIMM has conducted **extensive prior metallurgical testwork** on Chvaletice for EMN since 2017, including pilot plant tests. CRIMM are world leaders in manganese processing and battery materials production
- CRIMM scope of work includes DP design, delivery, installation, commissioning, laboratory set-up and operator training program. All equipment and **technology is conventional and commercially proven**

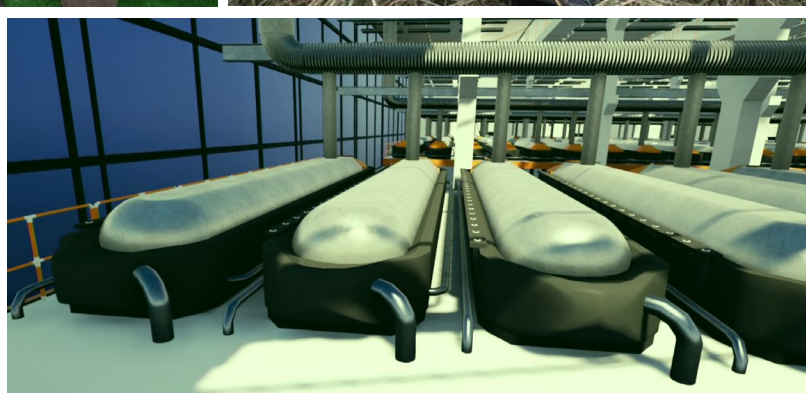
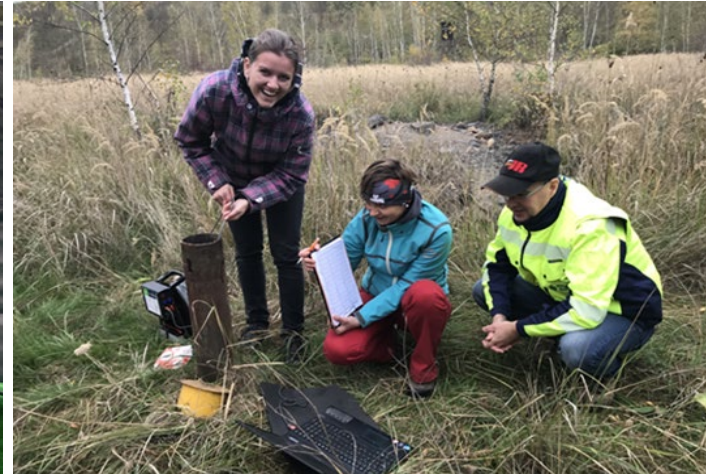


- DP total price ~US \$2.5 M, plus ~\$1.5 M installation / infrastructure cost. Annual operating cost ~\$1 M
- **DP replicates entire the 2019 PEA process flowsheet** and is designed to produce 32 kg of HPEMM or 100 kg of HPMSM per day
- DP is designed to deliver multi-tonne, finished -product samples to customers, either HPEMM or HPMSM, as required
- DP output for 1<sup>st</sup> year of production will be allocated to selected customers during H1 for product qualification process
  - **Strong customer interest** in testing and qualifying DP products
  - Typically a prelude to potential offtake agreements





# Thank You!



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