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LFP Cathode Patents Compared

Oxalic Acid as the Unique Technological Differentiator of Nano One Materials Corp.

(TSX: NANO)

Starting Materials & FEOC-Compliant Iron Feedstock Sourcing

Strategic Analysis

June 2026

Table of Contents

1. Executive Summary

This report analyses the patent landscape for lithium iron phosphate (LFP) cathode materials, with a focus on the technological moat of Nano One Materials Corp. (TSX: NANO). At its centre is oxalic acid as the chelating agent in the One-Pot process — a patented chemical step that is not disclosed in any comparable western patent. In parallel, the report maps the global availability of FEOC-compliant iron raw materials required for a western LFP supply chain.

Key Findings

Three key findings: (1) Tesla's process patent WO2025015194 shares five of seven describable process features with Nano One's One-Pot patent US12319590 — the chelation step remains entirely undisclosed by Tesla. (2) The One-Pot process is feedstock-agnostic: it accepts Fe_2O_3, FeOOH, Fe_3O_4, and iron metal from diverse geographic sources, structurally freeing itself from Chinese $FeSO_4$ dependency. (3) With Rio Tinto (IOC), Sumitomo Metal Mining, Hyundai Steel, LKAB, and Champion Iron, sufficient FEOC-compliant iron sources exist for all production phases through 2030+.

1a. Current Status: Press Release 25 June 2026

CONFIRMED — PRESS RELEASE: NANO ONE / WORLEY CHEMETICS, 25 JUNE 2026

On 25 June 2026, Nano One and Worley Chemetics announced completion of the One-Pot LFP CAM Technology Package (Class 3 / FEL-2 cost estimate, bankable for investment decisions). The package bundles a technology licence, process design package, and qualified key equipment into a single, cost-competitive offering for licensees. Two configurations are available: (1) Fully FEOC-compliant, using North American, European and South African equipment vendors exclusively; (2) A hybrid configuration adding Chinese vendors for non-IP-sensitive equipment in eligible jurisdictions. With this announcement, Nano One's H1 2026 milestone objective is officially met. The next catalyst: a first signed licence agreement.

The completion of the CAM Technology Package is the immediate context for this report: the package confirms that Nano One's One-Pot process — including all starting materials and supply chains — is investment-ready. The press release explicitly references qualified North American, European and South African equipment vendors, and cites the G7 declaration of 17 June 2026 on securing critical minerals supply chains as political tailwind. China additionally expanded export controls on LFP cathode materials and production equipment in 2025 and 2026 — further increasing the strategic value of the One-Pot process's feedstock agnosticism.

2. Background: Conventional LFP Manufacturing Pathway

Commercial LFP production has followed the Chinese $FeSO_4$-based standard route for decades. $FeSO_4$ is generated as a by-product of titanium dioxide manufacturing (sulfate process) — roughly 3.5 tonnes of $FeSO_4$ per tonne of TiO_2 pigment. This low-cost raw material is the central cost advantage of Chinese LFP producers.

Step	Process	Structural Problem
1. $FeSO_4$ Supply	By-product from TiO_2 sulfate process	Dependence on Chinese TiO_2 industry; FEOC risk
2. Precipitation / CSTR	$FeSO_4$ + Na_2CO_3 in continuously stirred tank reactor	Aqueous waste streams, Na_2SO_4 disposal, heavy-metal wastewater
3. Washing / Drying	Filtration, milling, sieving	Capital-intensive; multiple process stages required
4. Mixing with Li source	Mechanical blending with Li_2CO_3	Homogeneity difficult to control at scale
5. Calcination	800–900 °C under N_2 or H_2	Energy-intensive; demanding high-temperature infrastructure
6. Carbon Coating	Separate coating step	Additional equipment; quality variance possible

CONFIRMED — GEOPOLITICAL DEPENDENCY

NRCan (2026): 98% of all LFP cathode materials originate from China. Precursor production relies almost entirely on the Chinese $FeSO_4$ by-product from TiO_2 sulfate manufacturing. FEOC regulations under the US Inflation Reduction Act from 2025 onward make this pathway increasingly uneconomical for the North American market.

3. Nano One — One-Pot Process and Patent Portfolio

3.1 Core Patents

Nano One holds 52 granted and 54 pending patents (as of Q1 2026). The patents central to the LFP space:

Patent	Focus	Core Claim	Status
US11677077	Olivine LFP/C synthesis	One-Pot from Fe, Ni, Mn, Co sources plus organic acids in aqueous suspension; no $FeSO_4$	Granted Jun. 2023
US12319590	Olivine LFP (continuation)	Fe sources specified: Fe_2O_3, FeOOH, Fe_3O_4 preferred; oxalic acid as chelating agent explicitly named	Granted Feb. 2025
US12077452	NMC / LNMO	Multi-carboxylate chelation system; two-stage calcination in metal container	Granted Sep. 2024
US11735712	Surface stabilisation	$MnPO_4$ phosphate bonding to manganese oxide surface as stabilisation layer	Granted Aug. 2023

3.2 Oxalic Acid as the Patented Unique Differentiator

The One-Pot process is built around a single chemical core step: chelation with oxalic acid ($C_2H_2O_4$). This step performs three simultaneous functions explicitly protected in US12319590:

Function	Chemical Mechanism	Process Advantage
Chelation	Oxalate ions ($C_2O_4^{2-}$) coordinate Fe^{3+}/Fe^{2+} in aqueous solution; prevent premature oxidation and agglomeration	Homogeneous particle size distribution; reproducible crystal morphology
In-situ Reduction + Carbon Coating	Oxalate acts as reducing agent: Fe^{3+} to Fe^{2+} during precipitation; upon calcination under N_2, decomposes to CO_2/CO — direct in-situ carbon source	No separate carbon coating step required; oxalate serves simultaneously as reducing agent and carbon source
Precipitation Control	pH buffering by oxalate system precisely controls crystal growth; olivine structure forms directly without precursor detour	Highly ordered crystal structure; Fe/Li site disorder below 2%; superior electrochemical cycling stability

Simplified reaction sequence: Li_3PO_4 + FeOOH + $H_2C_2O_4$ form an iron-oxalate complex in aqueous suspension. Upon calcination under N_2, this decomposes directly to $LiFePO_4$/C. The in-situ generated CO/CO_2 produces the conductivity coating — without any separate process step.

> CONFIRMED — CRITICAL FINDING
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> No western competitor patent — neither Tesla WO2025015194, nor EcoPro disclosures, nor the Hyundai/EcoPro direct-synthesis package — reveals the chelation step or names oxalic acid as a process chemical. This is the sole unreplicated and patent-protected core step in the entire western LFP patent universe.

4. Patent Comparison: Nano One vs. Tesla / LG Chem / EcoPro / Hyundai

4.1 Tesla WO2025015194 — Cathode Powder and Processes

Tesla (inventors: Bastian Ewald, Yulong Liu, Anthony Thurston) published a 100+ page patent for an LFP cathode powder process in January 2025. Analyst Jordan Giesige (The Limiting Factor) explicitly identified the One-Pot approach as one of two core innovations — and named Nano One as the conceptual origin. Giesige openly speculated about a potential patent collision and described an IP cross-licence as the most likely resolution.

Tesla's process combines all starting materials in a single mixing tank (Tank 801) with no separate precursor step. Iron sources named in the patent: FeOOH, FeO, Fe_2O_3, Fe_3O_4, $FePO_4$, and iron metal — exactly the family preferred by Nano One in US12319590. $FeSO_4$ does not appear. Spray granulation with a recirculation loop is Tesla's proprietary process innovation.

4.1a Springpower Patents (Tesla US11909041B2) — Relevance for LFP

Two weeks before Tesla Battery Day 2020, Tesla acquired the patent applications of Canadian company Springpower International (Mississauga, ON) for a symbolic USD 3 — including what became patent US11909041B2 (granted February 2024). Several Springpower employees, including Yang Liu and Amrit Bhogan, moved directly to Tesla. Drew Baglino cited the process at Battery Day as a pathway to reduce cathode manufacturing costs by 75%.

What the Springpower patent is: an NMC/NCM precursor process that reacts metals in metallic form (Ni, Mn, Co) with an oxidising agent (O_2, nitrates, nitric acid) in an aqueous reaction system to produce metal hydroxide precursors. The core feature is recirculation of the reaction solution, generating little or no wastewater. It is structurally a two-step process: precursor production followed by lithiation.

> ANALYTICAL ASSESSMENT — SPRINGPOWER AND LFP
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> The Springpower patent solves Tesla's wastewater problem in NMC precursor production — not in LFP. It contains no single reference to phosphate, $LiFePO_4$, $FePO_4$, or the olivine crystal structure. It is conceptually designed for layered oxides (NMC/NCA) and is therefore entirely orthogonal to LFP chemistry. For Tesla's LFP process (WO2025015194, Austin), Springpower is irrelevant — the question of the chelation step in LFP direct synthesis remains completely unanswered. The Springpower patents do not render Nano One's oxalic acid step redundant.

4.2 LG Chem — LPF (LG Precursor-Free) Process

LG Chem (Cheongju, South Korea) presented its precursor-free LFP process at Interbattery in Seoul in March 2025 under the brand name LPF (LG Precursor-Free), becoming the first Korean company to mass-produce precursor-free cathode material. The process is based on direct calcination of custom-designed metals without an upstream precursor step — LG Chem describes it as 'direct calcination of customised metals bypassing the traditional precursor stage'.

What LG Chem discloses: direct calcination without precursor; improved low-temperature performance; reduced wastewater and CO_2 footprint versus the $FeSO_4$ standard route; mass production from H1 2025 in Cheongju. What LG Chem does not disclose: the specific iron source; the precise process chemistry (no reference to any chelating agent or organic acid); no publicly accessible patent that specifies the synthesis pathway.

Industry analyst James Frith (Volta Energy Technologies) commented that Chinese LFP relies on iron sulphate that is virtually free as a titanium dioxide refining by-product, whereas western producers must make $FeSO_4$ from iron filings and sulphuric acid at considerable added cost and complexity — making LG Chem's precursor-free route cheaper outside China and the supply chain more resilient. The iron source for LG Chem's LPF process has not been publicly disclosed.

ANALYTICAL ASSESSMENT — LG CHEM LPF

LG Chem's LPF process is the only commercially announced western precursor-free LFP process besides Nano One's One-Pot. The structural parallels are identical: no $FeSO_4$, no precursor stage, direct synthesis. The critical difference: LG Chem discloses neither chelating agent nor iron source — both core questions remain open. Whether LG Chem uses Nano One's oxalic acid step internally cannot be verified.

4.3 EcoPro BM and Hyundai Motor

EcoPro BM (South Korea) describes a direct synthesis process replacing $FeSO_4$ with pure iron or Fe_2O_3 — five of seven process features are textually identical to Nano One's patent. The chelation step is not disclosed.
The 4-year project (2024–2028) by Hyundai Motor, Kia, Hyundai Steel and EcoPro BM targets direct LFP synthesis without precursors. Hyundai Steel supplies high-purity iron powder from Korean recycled steel (50,000–60,000 tpa capacity). Here too: no reference to oxalic acid or polycarboxylic acids.

4.4 Comparison Matrix

Process Feature	Nano One US12319590	Tesla WO2025015194	LG Chem LPF (2025)	EcoPro BM	Hyundai/ EcoPro
No separate precursor (One-Pot)	Granted	Yes (Tank 801)	Yes — LPF core feature	Yes	Yes
No $FeSO_4$ / metal sulphate	Granted	Not listed	Implicitly excluded	Explicitly excluded	Explicitly excluded
Fe sources (specific)	Fe_2O_3, FeOOH, Fe_3O_4	FeOOH, Fe_2O_3, Fe_3O_4, $FePO_4$	Not disclosed	Fe or Fe_2O_3	Fe powder
Aqueous process	Granted	Slurry, wet preferred	Not disclosed	Assumed	Assumed
Oxalic acid / polycarboxylate chelation	GRANTED — core step	NOT disclosed	NOT disclosed	NOT disclosed	NOT disclosed
Direct metal calcination	Granted (in-situ)	Yes	Yes — explicitly stated	Assumed	Assumed
In-situ carbon coating	Granted (up to 3 wt%)	Yes (below 2% ash)	Not specified	Yes (assumed)	Yes
Calcination under N_2	Granted	Yes	Not specified	Yes	Yes
Mass production active	200 tpa (Candiac)	Ramp-up (Austin, TX)	H1 2025 (Cheongju, KR)	In preparation	Planned from 2028

ANALYTICAL ASSESSMENT

All four actors converge on the same fundamental process pathway: One-Pot, no $FeSO_4$, iron oxides as starting material. The sole unreplicated step is Nano One's oxalic acid chelation system. An IP cross-licence agreement would be the strategically logical resolution — Nano One holds the chemistry, Tesla holds the apparatus (spray granulation).

5. Iron Feedstock: Starting Materials in the One-Pot Process

5.1 Permissible Iron Compounds

The NRCan programme (C$3M, running to March 2028) explicitly funds process optimisation for a range of iron raw material sources. Patent US12319590 defines the permissible iron source space:

Compound	Formula	Fe Content	Availability	Status in Patent
Goethite (iron oxyhydroxide)	$FeOOH$	62.9%	Widely available, aqueous systems	Preferred (US12319590)
Haematite (iron oxide)	Fe_2O_3	69.9%	Most abundant iron compound globally	Preferred (US12319590)
Magnetite (mixed iron oxide)	Fe_3O_4	72.4%	LKAB, Fortescue, Champion Iron	Preferred (US12319590)
Iron metal (pure iron)	Fe	100%	GKN Hoeganaes, Hyundai Steel, Hoganas	Tesla preferred; Nano One accepts
Iron phosphate	$FePO_4$	36.8%	Mitra Chem / Sun Chemical (USA, developing)	Tesla patent; combined Fe+P source
Iron sulphate (excluded)	$FeSO_4$	36.8%	China (TiO_2 by-product)	EXPLICITLY EXCLUDED

5.2 Distinction from the Chinese $FeSO_4$ Pathway

The One-Pot process eliminates $FeSO_4$ for two structural reasons: first, the $FeSO_4$ route generates a Li_2SO_4 waste stream requiring costly wastewater treatment. Second, $FeSO_4$ is a by-product of Chinese TiO_2 production — structurally tied to Chinese supply chains. Nano One confirmed in its 2026 Stakeholder Letter: the One-Pot process enables cost-competitive use of alternative iron feedstocks sourced from various jurisdictions worldwide, eliminating the need to source iron phosphate precursor from China.

CONFIRMED — STRATEGIC ADVANTAGE

The feedstock-agnostic nature of the One-Pot process is not only a technological but the central geopolitical advantage for western LFP supply chains. Nano One requires no process adaptation to achieve FEOC compliance — the process is designed for it from the ground up.

6. FEOC-Compliant Iron Sources — Global Map

6.1 Tier 1: Validated or Under Validation

Rio Tinto — Iron Ore Company of Canada (IOC)

The 2022 collaboration agreement explicitly covers a study of Rio Tinto's battery metal products as feedstock for Nano One's cathodes. A 2026 NRCan report cites 'pre-qualification work with Rio Tinto' on iron. IOC (Labrador City / Sept-Iles, QC) produces high-grade DR pellets (67% Fe, low impurities) as the basis for a battery-grade FeOOH/Fe2O3 processing pathway being developed under the NRCan programme through March 2028. RTIT Sorel-Tracy: iron powder plant closed end-2025; high-purity iron production continues. Full RTIT sale on hold since March 2026 (no Chinese buyers possible — geopolitical constraints).

Sumitomo Metal Mining (SMM, Japan) — NRCan Validation Partner

SMM has been Nano One's official Key Technology Partner and NRCan iron feedstock validation partner since September 2025. SMM supplies Tesla indirectly via Panasonic (NCA cells for Model S/X/3) and holds metallurgical refinery infrastructure in Japan plus access to Australian magnetite through Japanese trading relationships. As a strategic investor, SMM holds C$16.9M in Nano One (2023).

6.2 Tier 2: Scalable, FEOC-Compliant, No Confirmed Nano One Link

Supplier	Country	Product / Capacity	FEOC	Channel to Nano One
Hyundai Steel	South Korea	Fe powder from recycled steel, 50,000–60,000 tpa	Yes	Via SMM network
LKAB (Kiruna)	Sweden	Magnetite pellets / fines, 67–70% Fe, large scale	Yes	Likely 'European iron supplier' (Stakeholder Letter 2026)
Champion Iron (Bloom Lake)	Quebec, Canada	Magnetite concentrate 66–68% Fe, 10 Mt/yr ore cap.	Yes	Geographically close to Candiac; CUSMA-compliant
GKN Hoeganaes	Tennessee, USA	Fe powder from scrap + First Phosphate magnetite	Yes	LFP cells already validated; non-exclusive
Hoganas AB	Sweden / USA	Sponge iron + atomised Fe powder, ~20,000 tpa battery-grade	Yes	Active LFP battery programme
Fortescue Iron Bridge	W. Australia	Magnetite concentrate 67–68% Fe, 22 Mt/yr	Yes	Via SMM / Australian trading relationships

6.3 Tier 3: Structurally Suitable, Not Yet Available at Scale

Supplier	Technology	Timeline	FEOC	Relevance for Nano One
POSCO HyREX (Pohang)	H2 direct reduction, FINEX fluidised bed, pilot Jun. 2024	Full scale 2031+	Yes	Potential licensee in Indo-Pacific
POSCO Port Hedland (Australia)	DRI from Australian magnetite + green H2 (ENGIE JV)	2028+	Yes	Long-term large-volume source
IOC-DRI H2 Route	IOC DR pellets to battery-grade FeOOH/Fe2O3 via H2	2028–2030	Yes	Long-term Rio Tinto strategy for Nano One

7. Regulatory Framework: FEOC and IRA

US FEOC (Foreign Entity of Concern) regulations under the Inflation Reduction Act and the One Big Beautiful Bill Act (OBBBA, July 2025) define which battery materials qualify for tax credits (45X Advanced Manufacturing Credit, 30D Clean Vehicle Credit). FEOCs include entities controlled by China, Russia, North Korea, or Iran.

Regulation	Content	Implication for LFP Iron Sources
Material Assistance Cost Ratio (MACR)	From 2026: min. 55% of material costs from FEOC-free suppliers; rises to 75% by 2030	Chinese $FeSO_4$ counts as FEOC cost; $FeOOH$/Fe_2O_3 from western sources FEOC-free
Steel & Iron (Exemption)	Explicitly excluded from FEOC cost calculation for ESS projects (IRS Notice 2026-15)	Iron powder supplier for energy storage applications less critical regulatorily
45X Advanced Manufacturing Credit	CAM producer receives credit per tonne of cathode material; iron origin influences amount	Nano One as CAM producer in Candiac fundamentally qualified
USMCA / CUSMA	Canadian-produced materials qualify for US market without additional tariffs	Nano One Candiac + Champion Iron + POSCO Becancour = USMCA-compliant

CONFIRMED — STRUCTURAL COMPLIANCE

The One-Pot process is structurally IRA/FEOC-compliant: it accepts exclusively iron compounds ($FeOOH$, Fe_2O_3, Fe_3O_4, iron metal) that do not originate from Chinese $FeSO_4$ by-product streams. Nano One requires no process adaptation to achieve FEOC compliance — the process is designed for it from the outset.

8. Strategic Conclusions

8.1 Patent Moat

Nano One's oxalic acid chelation step is the sole patent-protected and publicly unreplicated core step in the western LFP patent universe. Tesla's process patent overlaps with Nano One's process in five of seven features — the chelation step remains unresolved. Jordan Giesige (The Limiting Factor) has openly addressed a potential patent collision: Tesla holds the apparatus (spray granulation), Nano One holds the chemistry (chelation step). An IP cross-licence agreement would be the logical resolution.

8.2 Feedstock Agnosticism as Competitive Advantage

The One-Pot process accepts the full spectrum of FEOC-compliant iron sources and enables regionally tailored supply chains for each licence site worldwide. Nano One is therefore the only western CAM producer structurally independent of Chinese $FeSO_4$ — and is systematically extending this independence to additional iron sources through the NRCan programme running to March 2028.

8.3 Iron Source Timeline

Phase	Period	CAM Requirement	Primary Iron Sources
Pilot / Early Commercial	2026–2027	200–800 tpa	GKN Hoeganaes (Tennessee), Hoganas (Sweden/USA), Champion Iron (Quebec)
First Licence Plants	2027–2029	5,000–25,000 tpa	Rio Tinto IOC, Hyundai Steel, LKAB, Champion Iron
Full Scale	2030+	100,000+ tpa	IOC DR pellets (H_2 route), Fortescue Iron Bridge, POSCO HyREX

8.4 The Strategic Triangle: Nano One — Rio Tinto — Sumitomo

The combination of Rio Tinto (lithium feedstock validated; iron pre-qualification ongoing) + SMM (Key Technology Partner, NRCan validation, strategic investor C$16.9M) + POSCO Future M (Becancour NCM, October 2026) forms a coherent industrial structure. The South Korean-Japanese industrial bloc is converging on the same process paradigm that Nano One has developed. SMM is the explicit bridge between Nano One's One-Pot technology and the Indo-Pacific market.

> CONFIRMED — OVERALL CONCLUSION
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> Nano One holds: (1) the only operational western LFP-CAM process (Candiac, 200 tpa); (2) the only patent-protected chelation system (oxalic acid, US12319590); (3) the only feedstock-agnostic process technology for FEOC-compliant LFP; (4) with Rio Tinto and Sumitomo Metal Mining, the most strategically coherent partners for western and Indo-Pacific scaling. The iron source question is structurally resolved — not through a single supplier, but through regional supply chain pluralism that permanently circumvents China's $FeSO_4$ monopoly.

8.5 The Quebec Keiretsu: Champion Iron — Nippon Steel — SMM — Nano One

A connection that has received little public attention significantly completes the strategic map of the iron feedstock thesis: Champion Iron, Nippon Steel, and Sumitomo Metal Mining belong to the same Japanese industrial network — and all three are directly linked to Nano One.

In September 2025, Champion Iron (51%), Nippon Steel (30%), and Sojitz (19%) formed the Kami Iron Mine Partnership for the Kamistiatusset iron ore project in Quebec. Nippon Steel and Sojitz made combined initial cash contributions of USD 68.6 million. Champion Iron already operates Bloom Lake (66-68% Fe magnetite concentrate, Fer-Mont, QC) and is developing the adjacent Kami Project with Nippon Steel and Sojitz as the next production stage.

Nippon Steel was formed in 2012 by merger with Sumitomo Metal Industries — the steel arm of the Sumitomo keiretsu. Sumitomo Metal Mining (SMM) is an independent but closely connected core member of the same Sumitomo keiretsu. SMM is simultaneously Nano One's Key Technology Partner (since September 2025), NRCan iron feedstock validation partner, and strategic investor (C$16.9M, 2023). The keiretsu logic: Nippon Steel/Sojitz builds a Quebec iron ore position through Champion Iron, while SMM secures the battery-grade processing technology through Nano One — both within the same Japanese industrial network.

> THESIS · SPECULATION — KEIRETSU CONCLUSION
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> The complete supply chain within the Sumitomo keiretsu reads: Champion Iron Bloom Lake (magnetite concentrate, Quebec) □ Nippon Steel / Sojitz as strategic investors and future Kami production □ SMM as processing and validation partner for battery-grade iron feedstock □ Nano One One-Pot process (Candiac, Quebec) □ LFP-CAM for western and Indo-Pacific licensees. This is not hypothesis — all four connection lines are publicly confirmed. Champion Iron is therefore in all likelihood one of the anonymously cited 'North American iron suppliers' in the 2026 Stakeholder Letter.

8.6 Future Outlook 2029+: Nippon Steel / US Steel as Iron Feedstock

With the acquisition of US Steel (completed June 2025, USD 14.1 billion), Nippon Steel now controls two strategic iron ore sources in North America: US Steel's Minnesota mines (Minntac, Keetac) and — through the Kami Iron Mine Partnership — Champion Iron in Quebec. Nippon Steel thereby potentially holds the largest western iron raw material base in the entire Nano One ecosystem.

Asset	Location	Product	Capacity	Status	Battery-grade?
Keetac Mine	Keewatin, Minnesota	DR-grade taconite pellets (>65% Fe)	4 Mt/yr	In production since 2022	Not yet — purity below battery-grade
Minntac Mine	Mountain Iron, Minnesota	Standard taconite pellets (65% Fe)	Largest US taconite mine	Ongoing	No — standard quality
Big River DRI (planned)	Osceola, Arkansas	DRI / HBI from Keetac pellets + natural gas	New, ~2 Mt/yr	Under construction, start H1 2029	Potential — high-purity Fe after processing
Champion Iron Bloom Lake	Fer-Mont, Quebec	Magnetite concentrate (66-68% Fe)	10 Mt/yr ore	Active production	Validation pathway via SMM
Kami Iron Mine (planned)	Labrador Trough, Quebec	High-grade magnetite ore	TBD	Partnership phase, Initial Closing Sep. 2025	Long-term potential

Why US Steel cannot supply battery-grade feedstock in the near term: Keetac DR pellets are optimised for steelworks DRI processes — SiO_2, Al_2O_3, and TiO_2 impurities are significantly above battery-grade requirements. The chemical conversion step from DR pellet to battery-grade $FeOOH/Fe_2O_3$ is neither present nor planned at Nippon Steel/US Steel. Additionally, the National Security Agreement (NSA) contains explicit restrictions on maintaining production and repurposing existing US sites.

THESIS · SPECULATION — FUTURE OUTLOOK 2030+

Once Nippon Steel's Big River DRI plant (Arkansas, 2029) is operational and intra-keiretsu knowledge transfer between SMM (Nano One's battery-grade validation partner) and Nippon Steel takes effect, a fully integrated iron pathway within the Sumitomo network becomes feasible: Keetac DR pellets (Minnesota) or Champion Iron magnetite (Quebec) □ Nippon Steel DRI/HBI (Arkansas) □ SMM battery-grade processing (Japan / Indo-Pacific) □ Nano One One-Pot (Candiac) □ LFP-CAM. This would represent the largest-capacity FEOC-compliant iron supply chain for western LFP globally — fully integrated within a single keiretsu network. Realistic timeline: 2030-2032.