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The Iron Chain

Nickel by-product iron, Tesla and the One-Pot process: reconstructing a raw-material architecture

Independent shareholder research

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Not investment advice. The author holds a position in Nano One Materials Corp.

0 Key Findings

This report reconstructs a raw-material architecture from publicly documented parts: Tesla secures nickel sources and contractually locks in their iron by-products; Sumitomo Metal Mining (SMM) has produced that very iron at industrial scale for a decade and a half and is simultaneously validating Nano One's iron-feedstock programme; Rio Tinto unites nickel, iron and lithium under one roof and holds an investment in Nano One; Worley covers the entire sulphur value chain through Chemetics and Comprimo and is already building the One-Pot reactors; and since February 2026 the Canada Growth Fund has put sovereign capital behind the western nickel path. Every link is source-hardened. Joining the links into one chain is a thesis — but one that currently faces no competing western process.

CONFIRMED

In the Talon agreement (January 2022), Tesla explicitly secured entitlement to all iron and cobalt by-products of the Tamarack nickel mine. Tesla's blend patent WO2024/229047 defines the target chemistry: 90–99% LFP/LMFP plus 0.1–15% nickel-oxide material. SMM has been the technical validation partner for Nano One's iron-feedstock programme under NRCan since September 2025 and a named strategic collaborator since March 2026 — alongside Worley and Rio Tinto.

ANALYTICAL ASSESSMENT

Nickel by-product iron (HPAL hematite, pyrrhotite derivatives such as FeOOH) is materially the most logical western LFP iron path — and the One-Pot process is the only publicly documented western process whose design assumptions (direct oxide intake, sulphate-free chemistry, single-step doping, replicable modules) match precisely this feedstock world.

THESIS · SPECULATION

That the links are being assembled in a coordinated fashion — with Tesla as the end customer of a One-Pot-based LFP chain built on nickel by-product iron — is documented nowhere. This reading is speculation with named falsification criteria (Section 9). The silence of all parties is consistent with the thesis, but does not prove it.

1 The Chain at a Glance

Link	Actor	Core finding	Status
1 · Demand	Tesla	Nickel contracts with an explicit iron by-product clause (Talon); HPAL partnership (Prony); blend patent “LFP with a pinch of nickel”; without US LFP CAM, no LFP vehicles in North America	Confirmed
2 · Production	Sumitomo Metal Mining	HPAL nickel since 2005 (Coral Bay) and 2013 (Taganito); iron precipitates in-process as hematite (Fe2O3), purified under SMM's own patents; NRCan validation partner of Nano One	Confirmed
3 · Resource roof	Rio Tinto	Majority of the Tamarack JV (nickel + iron), IOC iron ore, Arcadium lithium, investor in and strategic collaborator of Nano One	Confirmed
4 · Engineering	Worley (Chemetics + Comprimo)	Complete sulphur value chain; Chemetics fabricates the One-Pot reactors; industrial precedent: Inco/Falconbridge processed pyrrhotite into iron pellets and sulphuric acid from the 1950s to 1991	Confirmed
5 · Capital	Canada Growth Fund (with Exiro, Orion)	Consortium acquires 81.1% of Vale's Thompson nickel complex; up to US$200M investment; federal capital secures FEOC-free nickel	Confirmed

Link	Actor	Core finding	Status
Keystone	Nano One (One-Pot/M2CAM)	The only publicly documented western process with direct oxide-feedstock intake, no FP precursor and no sulphate waste — the fit to links 1–5	Analytical

The evidentiary method of this report is simple: each link is documented on its own, and every connection between links is labelled as what it is — a documented working relationship, a material fit, or a thesis. The strength of the overall argument rests not on any single exhibit, but on five independently documented links meshing without remainder — and on there being exactly one process that fits the assembly.

2 Link 1 — Tesla: Buying Nickel, Taking the Iron

Tesla's nickel strategy has been documented since 2022 — and it is strikingly iron-conscious. The supply agreement with Talon Metals (January 2022) for 75,000 tonnes of nickel in concentrate from the Tamarack project (Minnesota) contains a clause that drew little attention at the time: Tesla is entitled to all iron and cobalt by-products of the mine. Such a clause costs negotiating capital and ties up rights — it only makes sense if the buyer sees a use for the iron, or wants to keep that option strategically open.

Second touchpoint: since 2021, Tesla has been the technical and industrial partner of Prony Resources in New Caledonia — an HPAL operation, i.e. exactly the process class whose residue is iron-rich. Third touchpoint: the blend patent WO2024/229047, developed with Jeff Dahn (Dalhousie University), which defines the target chemistry: 90–99% by weight LFP or LMFP, blended with 0.1–15% (as lean as 0.1–3%) nickel-oxide material such as NMC or NCA, the nickel component pre-processed by milling and heating to 650–800 °C. The patent data show over 90% capacity retention after 7,000 hours of cycling at 40 °C — and, most notably, the nickel addition reduces the dissolution of iron from the LFP material. In this chemistry, nickel and iron are not competitors but symbionts.

The pressure to act is binding: under the current tariff regime, Tesla sells no LFP vehicles in North America; only Megapack and Powerwall run on LFP, being exempt as stationary products. Without domestic LFP CAM there is no LFP vehicle in the US market — and domestic LFP CAM requires western battery-grade iron.

CONFIRMED

Talon agreement incl. iron/cobalt by-product entitlement (January 2022; value estimated in excess of US$1.5B at then-current nickel prices); Tesla as technical partner of Prony (HPAL, New Caledonia); blend patent WO2024/229047 with the figures cited; no Tesla LFP vehicles in North America under the current tariff regime.

THESIS · SPECULATION

Tesla is systematically building access to western battery iron via the nickel route — contractually (Talon), operationally (Prony), chemically (the Dahn blend). The three touchpoints are individually documented; their reading as a strategy is interpretation. Caveat: the operational situation in New Caledonia has been uncertain since the 2024 nickel crisis.

3 Link 2 — Sumitomo Metal Mining: the Industrial Proof

What is pilot scale at Talon, SMM has run industrially for a decade and a half: in the Philippine HPAL plants Coral Bay and Taganito, the iron in the laterite ore hydrolyses in the autoclave at over 200 °C predominantly to hematite (Fe_2O_3) — regenerating the sulphuric acid in the process. Nickel concentrates from such ores contain roughly four times more iron than nickel; the “by-product” is, by mass, the main stream. SMM holds its own purification patents: calcining the neutralised leach residue at 600–1400 °C down to a sulphur content of at most 1% — so far targeting the steel industry.

The keystone of this link is a documented working relationship: since September 2025, SMM has been the technical validation partner for Nano One's iron-feedstock programme under the NRCan grant; the March 2026 release names SMM as a strategic collaborator and states the goal explicitly — cost-competitive input of alternative iron feedstock sourced across jurisdictions, eliminating FP precursor procurement. A nickel producer that has known and marketed its own iron waste stream for years is validating the process built to digest precisely such oxides. At the same time, SMM is part of Tesla's cell supply chain as an NCA producer via Panasonic — the nickel component of the Dahn blend is SMM core product.

CONFIRMED

HPAL hematite as an in-process product (Coral Bay/Taganito); SMM purification patents (calcination, S at or below 1%); ~4:1 iron-to-nickel ratio in concentrate; SMM as NRCan validation partner (09/2025) and strategic collaborator (03/2026); SMM as NCA supplier within the Panasonic/Tesla chain.

ANALYTICAL ASSESSMENT

The gap between ironmaking grade and battery grade (residual sulphur, trace elements) and the low oxalic-acid reactivity of highly calcined alpha-hematite are the two engineering problems a validation programme with SMM would sensibly address. This reading of the NRCan work programme is plausible but unpublished. Argonne's finding that Ni/Mn residues can actually improve cathode performance eases the purity problem from the requirements side.

4 Link 3 — Rio Tinto: All Raw Materials Under One Roof

Rio Tinto is the only company in the world that combines every LFP raw-material stream with an equity stake in the process owner: the majority of the Tamarack JV with Talon (nickel with iron by-product, offtaker Tesla), one of North America's largest iron-ore businesses in IOC, a leading lithium position following the Arcadium acquisition — and, since 2022, an investment in Nano One plus strategic collaboration. Wherever the iron chain is picked up, Rio Tinto sits at one end of it.

ANALYTICAL ASSESSMENT

The closure of the Sorel-Tracy metal-powder facility remains ambivalent evidence: it may mean the end of the iron-powder path originally communicated in 2022 because a better path (by-product oxides) exists — or simply the end of the powder path. Both readings are consistent with the facts; this report deliberately does not count the closure as evidence for the by-product thesis.

5 Link 4 — Worley: Sulphur Solved — Since 1950

The only genuine technical obstacle on the nickel-iron route is sulphur: HPAL hematite carries residual sulphur, and pyrrhotite *is* iron sulphide. Worley covers the complete sulphur value chain through two sister brands: Chemetics (sulphuric-acid plants including metallurgical roast-gas processing, acid concentration and regeneration) and Comprimo (gas treatment and sulphur recovery, more than 1,200 licensed units, the leading market share). Chemetics already fabricates Nano One's One-Pot reactors; Worley leads the ISBL engineering in Candiac and completed the FEL-2 package in June 2026. The sulphur competence does not need to be bought in — it is on the same payroll as the reactor build.

Nor is the route an invention: from the 1950s onward, Inco (now Vale) and Falconbridge (now Glencore) operated industrial plants in the Sudbury basin that processed pyrrhotite separately — recovering nickel, converting the iron to iron-oxide or metallic iron pellets for the steel industry, and recovering the sulphur as sulphuric acid or elemental sulphur. The last roasters ran until 1991. The loop roast » iron oxide » acid » back to leaching is seventy years of industrial history. The only new element is the buyer of the iron: no longer the steel mill, but the battery — at battery-material rather than steel prices.

And the raw material is already lying there, ground: the Sudbury basin holds a conservative 50–100 million dry tonnes of pyrrhotite tailings at 0.8–1.0% nickel (600–800 kt contained nickel), reclaimable by surface mining, ferromagnetic and therefore cheap to pre-concentrate — with an in-situ value above US$100/t including cobalt, copper and precious metals.

CONFIRMED

Chemetics/Comprimo competence profiles and market position; Chemetics as fabricator of the One-Pot reactors; Worley FEL-2 completion (June 2026); historical pyrrhotite processing by Inco/Falconbridge (1950s to 1991) into iron pellets and sulphuric acid; Sudbury tailings of 50–100 Mt at 0.8–1.0% Ni.

ANALYTICAL ASSESSMENT

The closed loop — SO2 from roasting/calcination » acid plant » sulphuric acid returned to HPAL or leaching — makes desulphurising the iron partly self-financing and permittable. An involvement of Comprimo or Chemetics in the iron-feedstock programme is not published; it is inference from competence and an existing contractual relationship.

6 Link 5 — Sovereign Capital: the Canada Growth Fund

On 19 February 2026, Vale Base Metals announced the reorganisation of the Thompson nickel complex in Manitoba: a consortium of Exiro Minerals, Orion Resource Partners and the Canada Growth Fund — the federal investment fund — acquires 81.1% of the new "Exiro Nickel Company" and will invest up to US$200M (C$280M) to secure the future of nickel mining in Thompson; Vale retains 18.9% and an offtake agreement for the concentrate, with closing expected by end-2026. Thompson produced roughly 12,000 tonnes of nickel in 2025 (+21% year over year) and, according to the new owners, has a profitable 20-year mine plan.

The significance for the chain operates on two levels. First: Canadian sovereign capital is now actively stabilising FEOC-free nickel — the same logic under which, in the US, the Department of Energy and the Defense Logistics Agency fund Talon's processing and recycling projects. Critical minerals are being treated as national assets, not as commodities among many. Second: western nickel survives the Indonesian glut only with additional margins — BHP Nickel West is suspended, Ravensthorpe mothballed. By-product revenues from iron, sulphuric acid and cobalt are exactly the margin story that public and private investors need to underwrite these assets. The Canada Growth Fund is thereby — intentionally or not — investing in the resource base of the iron chain.

CONFIRMED

Consortium structure Exiro/Orion/Canada Growth Fund (81.1%) with up to US$200M investment; Vale at 18.9% minority plus offtake; closing by end-2026; Thompson 2025 production of ~12,000 t nickel; DoE and DLA funding at Talon.

THESIS · SPECULATION

That the Canada Growth Fund is deliberately investing in a future battery-iron chain is not documented — what is documented is a nickel investment. The iron option comes as a free attachment: Thompson sits in the same geological regime (nickel sulphide with pyrrhotite) as Sudbury and Tamarack.

7 The Keystone — Why One-Pot Is the Fitting Solution

"Best solution" cannot be proven as an absolute. What can be proven is a sharper statement: against the five criteria that define this feedstock world, no second western process currently competes.

Criterion	What the iron chain requires	The One-Pot answer	Status
1 · Direct intake	Nickel by-products arrive as oxides: hematite (Fe_2O_3), goethite/FeOOH, magnetite (Fe_3O_4)	Direct intake of iron oxides and iron metal without an FP precursor and without the $FeSO_4$ detour — the core of the patent family (US 12,319,590; base process US 11,121,370) and of the NRCan goal statement	Confirmed
2 · Impurity tolerance	Nickel-derived iron carries Ni/Mn traces	Single-step doping architecture (dopants up to 10 mol% in the base patent); Argonne finding: Ni/Mn residues can improve the cathode; Tesla's blend patent wants nickel in the cathode anyway — the impurity becomes a feature	Analytical
3 · Sulphate-free chemistry	The sulphur loop (Worley) must not be burdened with new sulphate waste; permitting next to a mine	The M2CAM patents (JP 7518972, TW) deliberately avoid sulphate; no process wastewater — complementary rather than additive to the acid loop	Confirmed/Analytical

Criterion	What the iron chain requires	The One-Pot answer	Status
4 · Distributed geography	The sources are scattered: Philippines, Minnesota, Sudbury, Thompson, New Caledonia	Design One, Build Many: replicable plant modules instead of centralised bulk chemistry — the only architecture that fits distributed mine residues	Analytical
5 · Cost logic	China's advantage rests on waste feedstock ($FeSO_4$ from the TiO_2 industry, ~3.5 t per t of pigment) at a 98% world-market share of LFP CAM	Waste-stream input at near-zero marginal cost plus elimination of the precursor step replicates China's structural advantage instead of subsidising against it; communicated cost reduction of ~30%, elimination of up to 30 t of process water per tonne of LFP on the conventional route	Confirmed (figures) / Analytical (conclusion)

On the competitive field: the conventional western route (including the hydrothermal approach from the former Johnson Matthey portfolio) depends on the $FeSO_4/FePO_4$ path — precisely the raw material the West does not have at Chinese cost. Chinese “one-step” approaches (Lianfu/Ronbay, GCL) address the same precursor elimination but are unavailable to western chains for FEOC reasons. What remains: for converting western nickel by-product oxides into LFP CAM, One-Pot is the only documented candidate.

8 Cost Structure — China's Foundation and Its Copy

China's LFP dominance (98% of CAM) is a structural, not a technological advantage: FP precursor production rests on ultra-cheap iron sulphate arising as a waste stream of the titanium-dioxide pigment industry — roughly 3.5 tonnes of FeSO4 heptahydrate per tonne of pigment. The price of that advantage: up to 30 tonnes of process water per tonne of LFP material and a heavy wastewater burden. Whoever wants to copy the advantage in the West does not need a cheaper process for expensive feedstock — but a process for cheap feedstock: waste streams. HPAL hematite is currently sold to steel mills at iron-ore terms or landfilled; pyrrhotite tailings are cost centres of environmental management. By-product revenues from iron, sulphuric acid and cobalt simultaneously flip the economics of western nickel mines — and with them the narrative: not "LFP cannibalises nickel", but more batteries from the same tonne of rock. Nickel for NMC/NCA and the Dahn blend, iron for LFP — LFP demand *raises* the value of a nickel mine.

9 Burden of Proof and Falsification

A report that intends to leave little room for alternative readings must state the strongest counter-reading itself: nothing may be published simply because the assembled route does not exist as a coordinated plan. Compatibility is not proof of coordination. Against this stand four well-documented reasons why the chain — if it exists — would necessarily remain unpublished: (1) Tesla's documented confidentiality culture toward suppliers, and Nano One's own anonymisation discipline ("Major Global EV Leader" since 2020). (2) Securities law: TSX issuers disclose binding agreements, not constellations. (3) The trade-secret value of the recipes: the validated feedstock route is part of the asset sold under the licensing model. (4) Negotiating leverage before signature.

Crucially, the two readings leave different traces. Over the next two to three quarters, the chain would be recognisable — or not — by the following observable events:

Falsification/confirmation criterion	How it would show
Freshly published patent applications from 2026 onward	Feedstock-specific claims (oxide classes, pre-treatment, tolerance windows) in the emerging portion of the 47+ pending families
An "iron feedstock qualified/validated" release	Analogous to the lithium pre-qualification of October 2025 — with or without naming the source
Worley package details	An acid/gas train or roasting module within the plant scope after FEL-2
A follow-on SMM decision	LFP commercialisation with a siting or feedstock reference (Philippine hematite)
NRCan project reporting	Named iron sources or jurisdictions in the grant's reporting

> THESIS · SPECULATION — READING INSTRUCTION
> If these traces fail to appear over two to three quarters, the ensemble thesis loses weight and must be downgraded accordingly. If they appear, it was documented here before the market priced it. Both outcomes are results — only one of them is a trade.

10 Conclusion

Tesla has contractually secured nickel iron. Sumitomo produces it industrially and validates the process able to digest it. Rio Tinto unites every raw material of the chain with a stake in the process owner. Worley solves the sulphur with seventy years of precedent and is already building the reactors. The Canada Growth Fund places the resource base under sovereign protection. And at the centre stands the only western process whose design

assumptions — direct oxide intake, sulphate-free chemistry, doping tolerance, replicable modules, waste-stream economics — do not merely serve this world but appear built for it. Every link is documented. The chain is a thesis with an expiry date and a test programme. Now we deliver.

11 Sources (Selection)

Source	Content
Talon Metals / The Assay, January 2022	Tesla supply agreement Tamarack: 75 kt Ni, entitlement to iron/cobalt by-products, value estimated above US$1.5B
Talon Metals / Argonne National Laboratory (CRADA), April 2024	Process development for LFP use of iron sulphides; finding on Ni/Mn traces; FeSO4 and FeOOH streams from mini-pilot/tailings
Nano One / NRCan releases, September 2025 & March 2026	Iron-feedstock programme; SMM as validation partner and strategic collaborator; goal statement: alternative iron sources without FP precursor
WO2024/229047 A1 (Tesla/Dahn) via Not a Tesla App, May 2025	Blend cathode 90–99% LFP/LMFP + 0.1–15% NMC/NCA; pre-treatment at 650–800 °C; >90% retention after 7,000 h at 40 °C; reduced iron dissolution
Vale Base Metals PR / CBC / Mining.com, 19 February 2026	Exiro/Orion/Canada Growth Fund acquire 81.1% of Thompson; up to US$200M; Vale 18.9% + offtake; closing end-2026
SMM patents & technical reports (Coral Bay/Taganito)	Hematite precipitation in the HPAL autoclave; calcination at 600–1400 °C to S at or below 1%; iron-to-nickel ratio in concentrate
Peek et al. 2011; Rezaei et al. 2017; Springer/ScienceDirect	Sudbury pyrrhotite: 50–100 Mt of tailings at 0.8–1.0% Ni; historical Inco/Falconbridge processing until 1991
Worley Chemetics / Comprimo (company disclosures)	Complete sulphur value chain; >1,200 licensed units; metallurgical acid plants; reactor fabrication for Nano One
Nano One patent families	US 12,319,590 (LFP core family), US 11,121,370 / WO2018132903 (One-Pot base), JP 7518972 + TW (sulphate-free M2CAM), US 12,077,452, CN 113875045

Note: Independent shareholder research. Not investment advice. The author holds a position in Nano One Materials Corp. All statements to the best of the author's knowledge; epistemic classification (Confirmed / Analytical Assessment / Thesis·Speculation) given at the point of each claim.