

# Battery Recycling 'Hub' Engineering Cost Study Results

## Highlights

- Successful completion of the Engineering Cost Study ("ECS") for the hydrometallurgical refinery ('Hub') section of a 21,000tpa (~50tpd) Primobius lithium-ion battery ("LiB") recycling facility;
- The Hub refines "Black Mass"<sup>1</sup> produced from Primobius' shredding ('Spoke') plant, producing crystalline nickel, cobalt and lithium products, amongst others, for use in making new LiBs;
- Hub ECS total capital costs of €274M (including 15% contingency) and annual operating cost of €56M have been estimated to +/-25% accuracy;
- Fully integrated Spoke<sup>2</sup> and Hub capital cost are estimated at €377M<sup>3</sup>, with annual operating costs estimated at €83M<sup>3</sup> or €3,973<sup>3</sup> per tonne of LiB fed into the Spoke per annum;
- Lithium product is the largest revenue stream and expected to be lowest cost quartile; and
- Hub ECS completion allows Primobius to demonstrate the economics of its integrated LiB recycling plant packages to existing customers, partners and new customers.

Emerging sustainable battery materials producer, Neometals Ltd (ASX: NMT & AIM: NMT) ("**Neometals**" or "**the Company**") is pleased to announce the successful completion by Primobius GmbH ("**Primobius**") of the ECS for the Hub part (component) of a 21,000 tonnes per annum ("**tpa**") fully integrated LiB recycling plant. Primobius is the joint venture company owned 50:50 by Neometals and SMS group GmbH ("**SMS**")<sup>4</sup> that is commercialising proprietary LiB recycling technology originally developed by Neometals ("**Recycling Technology**").

The Hub is designed to process 12,000tpa of concentrate comprised of the anode and cathode materials ("**Black Mass**") arising from the processing of 21,000tpa of LiB modules and cells in the Spoke. The Hub can process cells and modules in multiple formats (i.e. pouches, prismatic and cylindrical) and cathode chemistries (NMC, NCA and LCO) from electric vehicle and consumer electronic batteries.

<sup>1</sup> "Black Mass" is recovered cathode active material (nickel, cobalt, manganese and lithium) and anode material (graphite) contained within LiBs

<sup>2</sup> For full details refer to Neometals ASX announcement titled "Primobius – 50tpd Spoke Engineering Cost Study Results" released 13 September 2022.

<sup>3</sup> German 12-month inflation: 6.4% (Source: DEstatis, [https://www.destatis.de/EN/Themes/Economy/Prices/Consumer-Price-Index/\\_node.html](https://www.destatis.de/EN/Themes/Economy/Prices/Consumer-Price-Index/_node.html)). and September 2022 €/US\$ F/X 1:1 (source RBC (<https://apps.royalbank.com/apps/foreign-exchange-calculator>))

<sup>4</sup> For full details refer to Neometals ASX announcement titled "Neometals and SMS group Create JV to Recycle Lithium-Ion Batteries" released 31 July 2020.

The Hub ECS is based on data from eight trials at Primobius' Hilchenbach demonstration plant. It also draws on information gained from detailed engineering and design work completed to date for the Mercedes Benz integrated Spoke and Hub project<sup>5</sup>. The Hub design produces 9,300tpa of hydrated nickel sulphate crystals, 4,300tpa of hydrated cobalt sulphate crystals and 1,600tpa of lithium fluoride crystals (LiB electrolyte feedstock) and a range of other metal and chemical by-products from a LiB feed with NMC622 chemistry. It can process NMC 111 to 811 and LCO LiBs. Lithium is the largest estimated revenue source and net of nickel and cobalt co-product revenue is expected to be lowest cost quartile.

SMS completed the mechanical plant and equipment package capital expenditure estimates ("CapEx") and provided erection/installation cost estimates for the Hub ECS with other appropriately qualified and experienced engineering companies providing the Balance of Plant and Non-Process Infrastructure ("NPI") CapEx, all to a level of +/-25% accuracy. Table 1 sets out Key Hub ECS Metrics. Further details, including assumptions are set out later in this announcement.

Table 1: Key Hub and Spoke ECS Metrics

Metrics	Shredding Spoke	Refining Hub
<b>Hub Annual Throughput / Capacity</b>	21,000tpa	12,000tpa Black Mass <sup>6</sup> feed
<b>Hub Annual Production<sup>7</sup>:</b> Hydrated nickel sulphate: $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}(\text{s})$ Hydrated cobalt sulphate: $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}(\text{s})$ Lithium fluoride: $\text{LiF}(\text{s})$ Manganese sulphate: 32% w/w $\text{MnSO}_4(\text{aq})$ Copper metal/cathode Ammonium sulphate: $(\text{NH}_4)_2\text{SO}_4(\text{s})$	12,000tpa Black Mass	9,300tpa 4,300tpa 1,600tpa 7,000tpa (liquid) 40tpa 23,400tpa
<b>Capital Cost (including 20% Contingency for Spoke and 15% Contingency for Hub)<sup>8</sup></b>	€102.5M <sup>9</sup> (US\$113.5M) <sup>9</sup>	€275M (US\$303M)
<b>Annual Operating Costs</b>	€27.1M (US\$30M)	€56M (US\$61M)
<b>Unit Operating Costs</b>	€1,292 <sup>9</sup> (US\$1,430) <sup>9</sup>	€2,644/tpa (US\$2,926/tpa) of LiB fed into a matching Primobius Spoke
<b>Workforce</b>	239	82

**Note:** Figures in Table 1 above relating to the Spoke have been adjusted from the original ASX Announcement in 2022<sup>5</sup> to dollars of today (2023), inclusive of F/X and inflation.

<sup>5</sup> For full details refer to Neometals ASX announcement titled "Cooperation Agreement with Mercedes-Benz" released on 13 May 2022.

<sup>6</sup> Black Mass quality is as produced from a Primobius Spoke.

<sup>7</sup> Based on NMC 622/BM 1 feed chemistry.

<sup>8</sup> Hub CapEx and OpEx cost estimates are denominated in Euros and USD using an exchange rate of 1 Euro: 1.1063 US\$ (Reserve Bank of Australia (RBA) 27/7/2023).

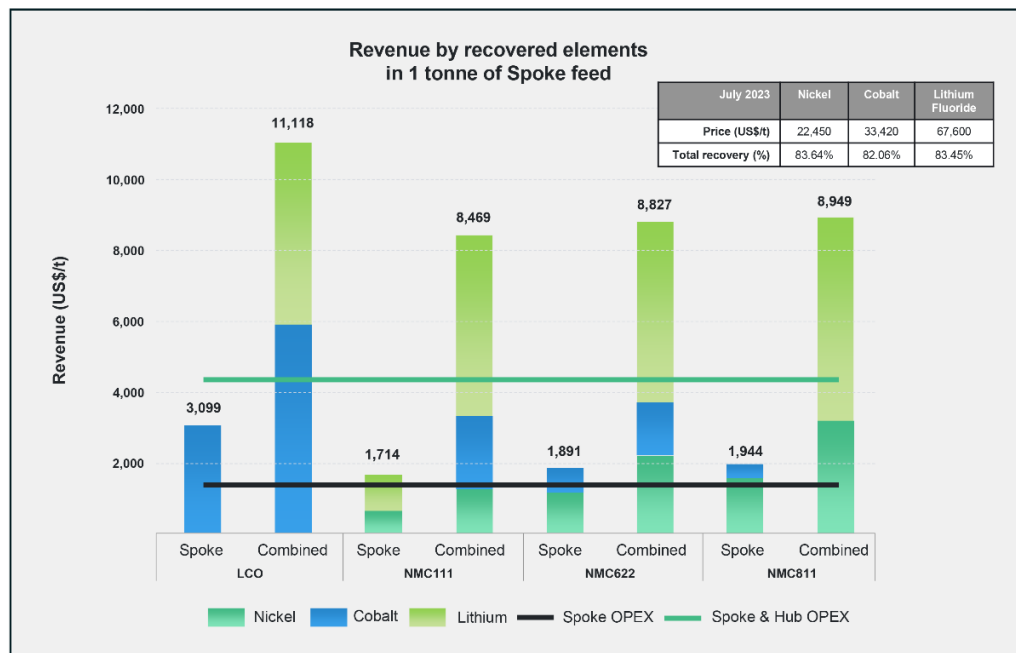
<sup>9</sup> German 12-month inflation: 6.4% (Source: DEstatis, [https://www.destatis.de/EN/Themes/Economy/Prices/Consumer-Price-Index/\\_node.html](https://www.destatis.de/EN/Themes/Economy/Prices/Consumer-Price-Index/_node.html)). and September 2022 €/US\$ F/X 1:1 (source RBC (<https://apps.royalbank.com/apps/foreign-exchange-calculator>))

## Economic Snapshot

Table 2 and Figure 1 below illustrate the strong cash generation potential of Primobius' Recycling Technology. They show that revenue is well in excess of Operating Cost Estimates ("OpEx") for both Spoke and for the integrated Spoke and Hub. Lithium comprises over 50% of the total revenue.

Table 2: Revenue by Recovered Elements in 1 Tonne of Spoke Feed - Data

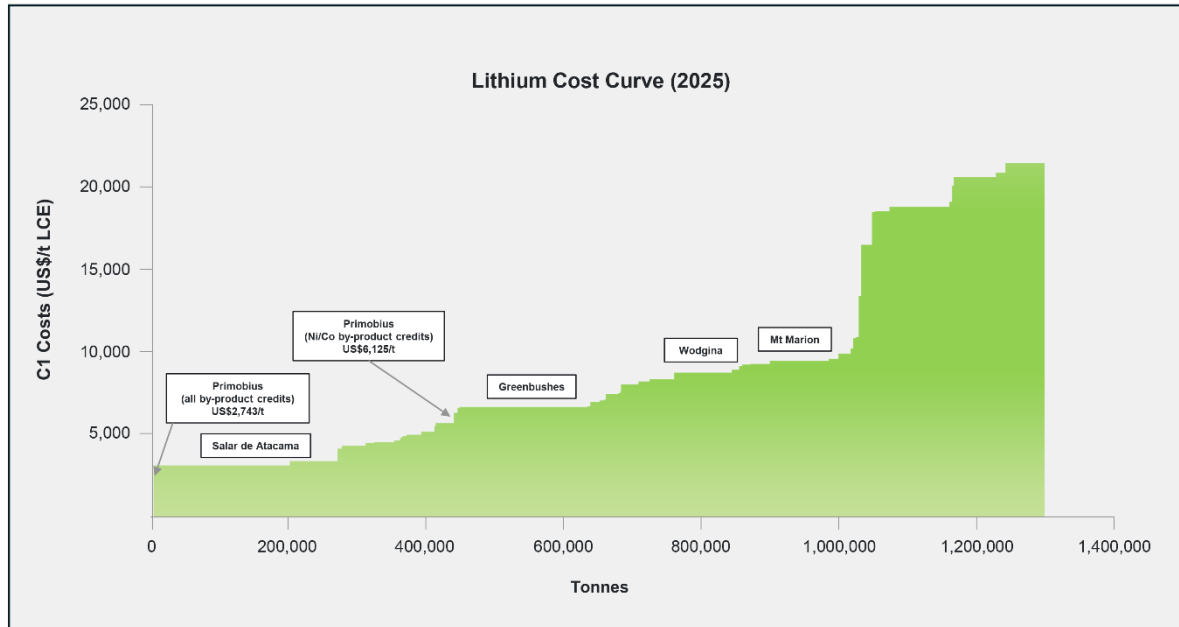
	LCO		NMC111		NMC622		NMC811	
	Spoke	Combined Spoke & Hub OpEx	Spoke	Combined Spoke & Hub OpEx	Spoke	Combined Spoke & Hub OpEx	Spoke	Combined Spoke & Hub OpEx
Nickel	-	-	681	1,340	1,138	2,240	1,634	3,216
Cobalt	3,099	5,984	1,033	1,995	752	1,453	310	598
Lithium	-	5,134	-	5,134	-	5,134	-	5,134
Spoke OpEx	1,430	1,430	1,430	1,430	1,430	1,430	1,430	1,430
Combined Spoke & Hub OpEx	4,355	4,355	4,355	4,355	4,355	4,355	4,355	4,355
Total Revenue	3,099	11,118	1,714	8,469	1,891	8,827	1,944	8,949



Source: London Metal Exchange (Ni/Co Price), Benchmark Mineral Intelligence (Li Price), Primobius (product recoveries, payabilities, cell composition).

Figure 1: Revenue by Recovered Elements in 1 Tonne of Spoke Feed - Graph

Primobius' Recycling Technology produces highly cost-competitive lowest cost quartile lithium sustainably (in lithium cost (US\$/t LCE) net of all by-product credits) as shown in Figure 2 below.



Source: London Metal Exchange (Ni/Co Price), Benchmark Mineral Intelligence (Li Price), Primobius (product recoveries, payabilities, cell composition).

**Figure 2: Lithium Cost Curve (2025)<sup>10</sup>**

By way of explanation of Figure 2 above, lithium is the key revenue for Recycling Technology. If revenue from nickel and cobalt is offset against the combined Spoke and Hub annual OpEx, a net effective lithium production costs can be calculated. This cost, divided by equivalent lithium carbonate annual production tonnes, gives C1 incremental production costs of US\$6,125/t. Other by-products such as copper foils (in the Spoke), copper cathode (in the Hub) and ammonium sulphate are also produced by the Recycling Technology. Offsetting revenue from all by-product credits results in an incremental LCE production cost of US\$2,743/t, putting the Primobius Recycling Technology at the bottom of the lithium cost curve, as shown.

In terms of next steps, Primobius is now in a position to offer mechanical plant and equipment supply contracts for 10tpd integrated (Spoke and Hub) LiB recycling facilities to existing customers, partners and licensees, as well as new customers who now have greater transparency on commercial economics. Further detailed engineering to support larger 21,000tpa integrated Spoke and Hub facility offerings will take place. Association for the Advancement of Cost Engineering (AACE) Class 3 level engineering and design are to be completed over the coming six months. These engineering and design activities will run in conjunction with further customer Hub demonstration trials.

<sup>10</sup> Key Production and Price assumptions used were: Nickel 2,095tpa/US\$22,450/t, Cobalt 913 tpa/US\$33,420/t, Annual OpEx US\$91.5, LCE equivalent: 2,272tpa

Neometals Managing Director Chris Reed said:

*"Successful completion of the Hub ECS enables our current and future customers and partners to quantify the economic benefits of Primobius' sustainable "closed loop" LiB recycling plants.*

*Primobius is expeditiously advancing towards product readiness for its ~50tpd recycling plants and is anticipating our maiden plant award this quarter from Mercedes Benz for an integrated 10tpd plant.*

*Primobius' primary business model is for the sale of recycling plants under technology licensing agreements to generate a portfolio of battery material royalties. We retain the flexibility to enter into joint ventures where a customer also requires operation and maintenance services and can also provide complete "closed loop" recycling as a service through our current Hilchenbach operation or a new dedicated plant."*

#### **CAUTIONARY STATEMENT**

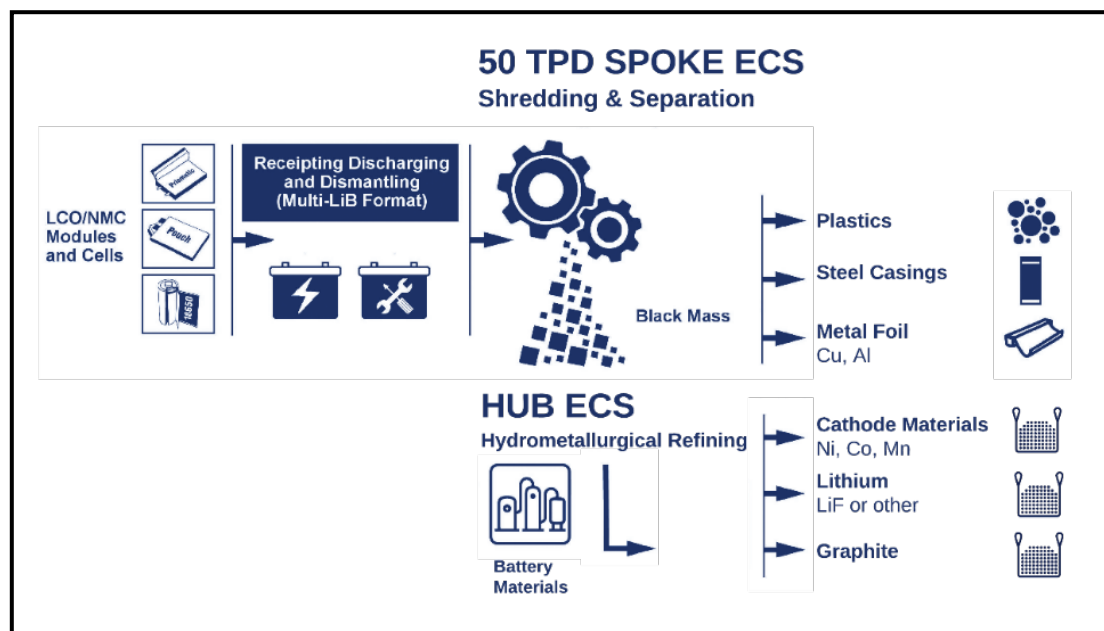
*The ECS referred to in this announcement has been undertaken to develop the technical feasibility and economic viability of Primobius' LiB recycling offering in the market. It has been undertaken to support product rollout as part of continued business growth. It is based on low-level technical and economic assessments that are not sufficient to provide definitive assurance of an economic development case, or to provide certainty that the conclusions of the ECS will be realised. Further evaluation work will be required before Neometals will be in a position to determine the viability of future recycling plant deployments and accurately define the business growth potential/trajectory of Primobius.*

*Given the uncertainties involved, all figures, costs and estimates quoted are approximate values and within the margin of error range expressed in the relevant sections throughout this announcement. Investors should not make any investment decisions based solely on the results of the ECS.*

## Background

The Recycling Technology recovers materials contained in LiB production scrap and end-of-life cells that might otherwise be disposed of in landfill. Current LiB recycling processes available in the market predominantly rely on high carbon emission pyrometallurgical technologies. Primobius' two stage process recovers lithium, nickel, cobalt and manganese battery materials (and physically recovers metals and plastics) into saleable products that can be reused in the LiB supply chain and produces by-products such as ammonium sulphate. The Recycling Technology prioritises maximum safety, environmental sustainability and product recoveries to support the circular economy and decarbonisation.

Figure 3 below illustrates how Primobius' fully integrated Spoke and Hub (and ECSs) fit together.



**Figure 3:** High level flowsheet showing the movement of materials from Shredding and Beneficiation ('Spoke') through to refining ('Hub') stages for the Recycling Technology and how the Spoke and Hub ECS interrelate

The Recycling Technology comprises two stages:

1. **"Spoke"** – Comprising LiB receipting, sorting, discharging, disassembly together with shredding and separation to physically separate all the components of LiBs received, by metal casings, electrode foils, plastics and battery materials; and
2. **"Hub"** – Comprising leaching, purification and crystallisation of the active materials suitable for use in production of LiB precursor, via a hydrometallurgical refining process.

Primobius currently operates a commercial 9tpd LiB recycling Spoke in Hilchenbach, Germany on a 5 day per week basis inclusive of LiB discharging and dismantling. A Hub demonstration plant is co-located at Hilchenbach and is run for process improvement and customer trial purposes. The Hub ECS design and underlying mass, energy, emissions and water balance have been informed by multiple demonstration trials in Hilchenbach.

Two cost studies have now been completed, namely:

#### (i) Spoke ECS

In September 2022<sup>11</sup>, Neometals released information on Primobius' 21,000tpa (~50tpd) of End of Life ("EOL") and/or production scrap LiB fed Spoke ECS.

The CapEx was US\$103.9M<sup>12</sup> (including 20% contingency) for the standalone Spoke. This figure included all direct and indirect costs, namely land purchase, buildings, plant and equipment, electrical, water, emissions and logistics management, infrastructure, and plant installation (EPC) costs. This CapEx also included costs associated with discharging and disassembly of batteries e.g. storage and handling areas.

The OpEx was US\$25.5M<sup>11</sup> per annum. A mixture of 70% modules and 30% cells as feedstock was assumed. This OpEx included the cost of labour for discharging and disassembly of modules/LiB systems.

Subsequent analysis of Spoke feed, post-disassembly, and plant survey data gathered from Hilchenbach has increased the forecast Spoke yield of Black Mass to 12,000tpa (from 21,000tpa LiB feed so a matching Hub needs to process 12,000tpa of Black Mass).

It is assumed for this Hub ECS that the Black Mass feedstock has been produced from EOL LiBs or production scrap from LiB manufacture, from a Primobius Spoke.

#### (ii) Hub ECS

This Hub ECS is for a 12,000tpa fed Hub. The Hub ECS CapEx estimate is €274M (+/-25%) (including 15% contingency) for a standalone Hub and OpEx estimate is €56M (+/-20% accuracy) or €2,644 per feed tonne of LiBs fed to a Primobius Spoke.

#### Market Backdrop

Battery raw materials are forecast to be in supply deficit over the coming decades. Almost 60% of today's lithium is mined for battery-related applications. This figure could reach 95% by 2030<sup>13</sup>. To meet demand, supply from mines would need to increase significantly. Furthermore, sustainable, lower carbon critical mineral sourcing, such as from recycling, is being supported by government initiatives globally. European Union (EU) policy and regulations, under the EU Battery directive, are targeting 65% of a LiB battery weight being recycled by 2026 increasing to 70% by 2030. For metals, a recovery rate of 90% for cobalt, nickel, and copper and 35% for lithium is targeted in 2026, increasing in 2030 to 95% and 70% respectively. In the USA the Inflation Reduction Act (IRA) 2022 is supporting through funding, increased recycling of LiB materials. Primobius can support its customers and partners deliver significant returns and social benefits globally. Primobius is principally a licensor of "closed loop" LiB recycling technology that produces sustainable battery materials for use in LiB manufacture.

<sup>11</sup> As announced in Neometals ASX announcement titled "Primobius – 50tpd Spoke Engineering Cost Study Results" released 13 September 2022.

<sup>12</sup> September 2022 €/US\$ F/X 1:1 RBA

<sup>13</sup> Advanced Industries Practice: Battery Recycling takes the Driver's Seat, McKinsey and Company, March 2023



## Assumptions

The development scenario assumed for the Hub ECS has been:

1. A Greenfield standalone site, theoretically located in Kaiserslautern in Germany, within the Einsiedlerhof industrial park and adjacent to the Spoke ECS site. Figure 4 below shows this theoretical location. This site is theoretical only and data can be translated and revised to other sites e.g., German industrial or chemical parks or sites elsewhere in Europe, North America and globally.



**Figure 4:** Theoretical Hub location of Kaiserslautern is located approximately 70km west of Heidelberg in Western Germany

2. Hub recovery for nickel, cobalt and manganese contained in the Black Mass fed into the Hub and over 83% lithium recovery has been assumed, based on demonstration trial results to date.
3. All battery products and by-products produced by the Hub are sold ex-works from site; this includes ammonium sulphate and graphite. Aluminium/iron oxide residue is disposed of to landfill as a benign waste.
4. It is assumed that wastewater is treated, and water is recovered and reused to the maximum extent possible and that the Emissions Management System meets local permit requirements.
5. In accordance with the Primobius Shareholders' Agreement, SMS is on a project-by-project basis the preferred supplier of engineering and design services and mechanical plant and equipment package delivery to Primobius (on a third-party/arms-length commercial agreement, that can be competitively benchmarked).
6. In terms of integrated "closed loop" information presented herein:
  - No transfer pricing between the Spoke and Hub has been applied. Nor was a cost to Primobius to purchase LiB feedstock for recycling in the Spoke ECS. Primobius is currently paid to receive batteries at its continuously operating Hilchenbach LiB Spoke recycling facility.
  - CapEx synergies in terms of infrastructure, namely administration buildings, electrical, water management, transportation network and storage related and emissions management, have been incorporated in the integrated Hub and Spoke data.



## Hub ECS Outcome Highlights

### a) Hub Layout and Logistics

An area of approximately 7 hectares is required for the Hub footprint. The layout for the Hub covered by this ECS is shown in Figure 5 below:

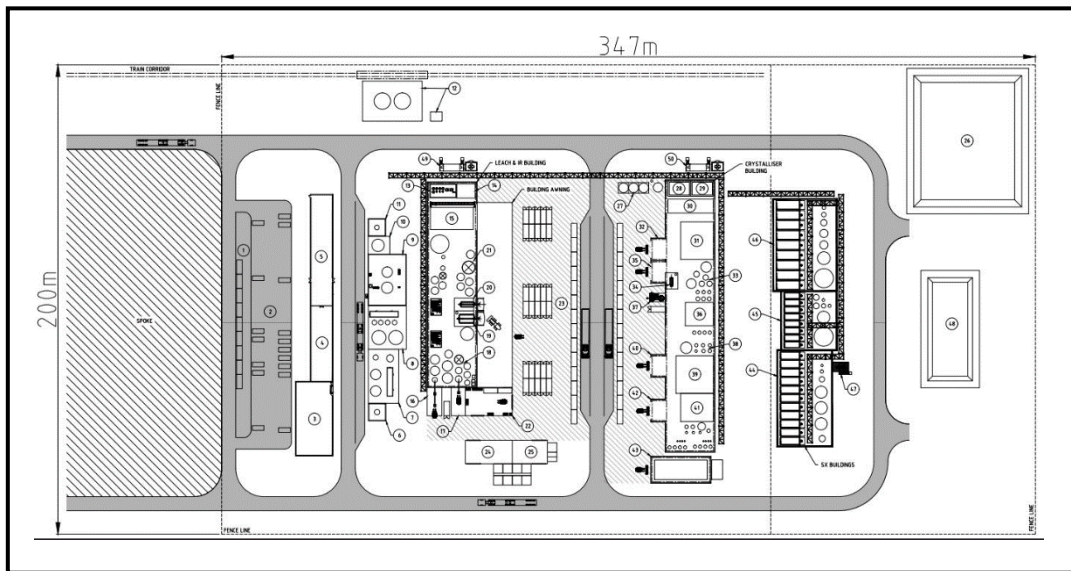


Figure 5: Preliminary Plant Layout

Figure 6 below illustrates the theoretical total co-located Spoke and Hub footprint at Kaiserslautern:

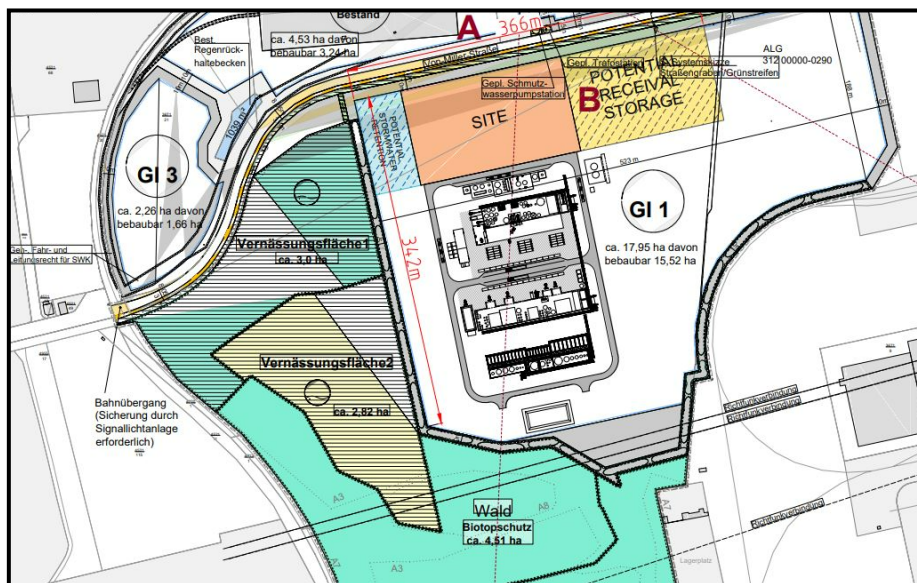
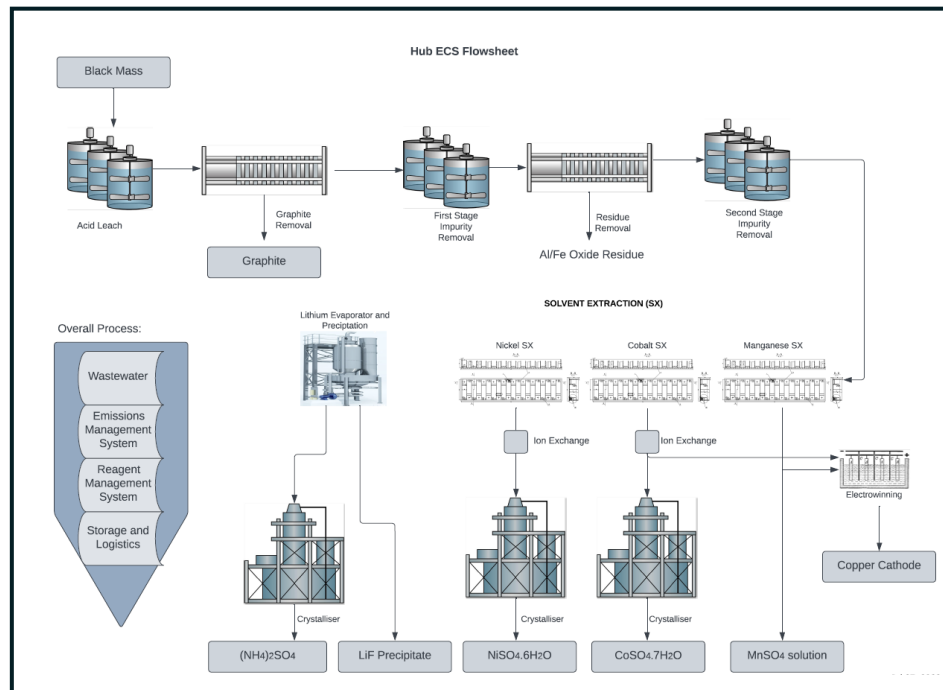


Figure 6: Co-located Spoke and Hub

## b) Processing Flowsheet

The proprietary Recycling Technology (patents under national phase applications in 16 jurisdictions) comprises conventional processes, equipment and unit operations using specific reagents and operating set points (atmospheric pressure, moderate temperature and pH wise). The Hub flowsheet in simplified format is shown in Figure 7 below:



**Figure 7: Simplified Hub Process/Flowsheet**

As shown above, Black Mass is leached with acid, then graphite is removed. Two-stage neutralisation and impurity removal follows then multi-stage Solvent Extraction (SX). Polishing/clean-up with Ion Exchange (IX) is followed by end-product crystallisation.

Wastewater, emissions, and reagent management systems underpin the plant operations, along with storage and logistics for the Black Mass feed, end products and waste.

## Capital Cost Estimate

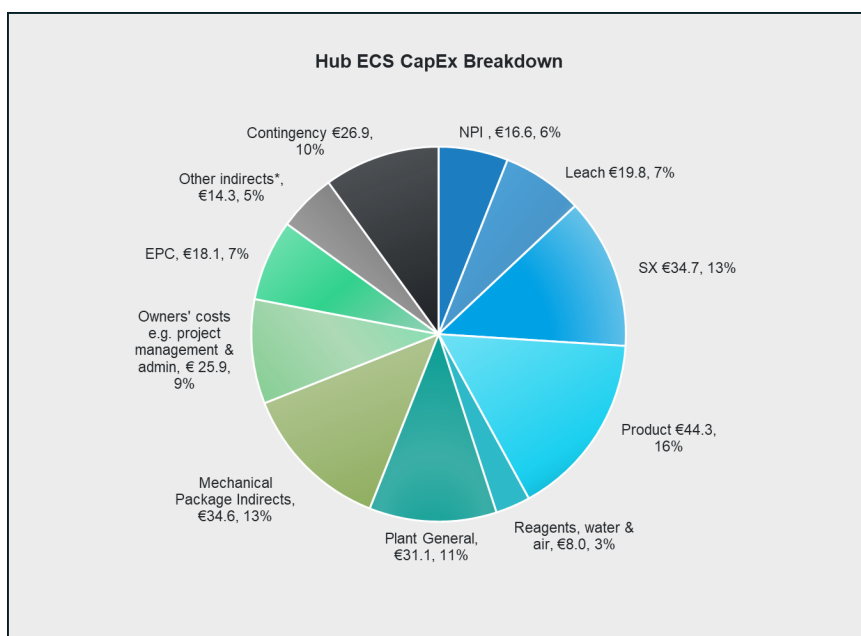
The Hub ECS CapEx estimates for the mechanical plant and equipment package and NPI (inclusive of 15% contingency) are to +/-25% accuracy (see Table 3 below). They are based on price estimates obtained directly from equipment suppliers, drawn from past vendor quotes for the same equipment or factored from smaller scale Hub vendor quotes.

Table 3: Hub Capital Cost Estimate

PARAMETER	SCOPE ITEM	COST (€)	COST (US\$) <sup>14</sup>
<b>DIRECT COSTS<sup>15</sup></b>			
	Process Plant and Equipment	47,949,878	53,047,769
	Balance Of Plant and NPI	106,387,451	117,698,253
<b>DIRECT COSTS TOTAL</b>		<b>154,337,329</b>	<b>170,746,022</b>
<b>INDIRECT COSTS<sup>2</sup></b>			
	Owners' Cost e.g., project management and admin	25,852,735	28,601,322
	Process Plant and Equipment	34,550,122	38,223,390
	Balance Of Plant and NPI	21,902,328	24,230,919
	Commissioning	1,431,774	1,583,996
	Critical Spares	2,863,548	3,167,992
	First Reagent Fills	6,237,470	6,900,620
<b>INDIRECT COSTS TOTAL</b>		<b>92,837,977</b>	<b>102,708,239</b>
<b>TOTAL DIRECTS &amp; INDIRECTS</b>		<b>247,175,306</b>	<b>273,454,260</b>
<b>OWNERS' CONTINGENCY</b>		26,931,353	29,794,616
<b>GRAND TOTAL</b>		<b>274,106,659</b>	<b>303,248,876</b>

<sup>14</sup> July 2023 €/US\$ F/X = 1.1063 (RBA 27/07/2023)<sup>15</sup> Inclusive of risk factor and growth (contingency)

The pie chart in Figure 8 shows a breakdown of the total Hub CapEx shown in Table 3 above.

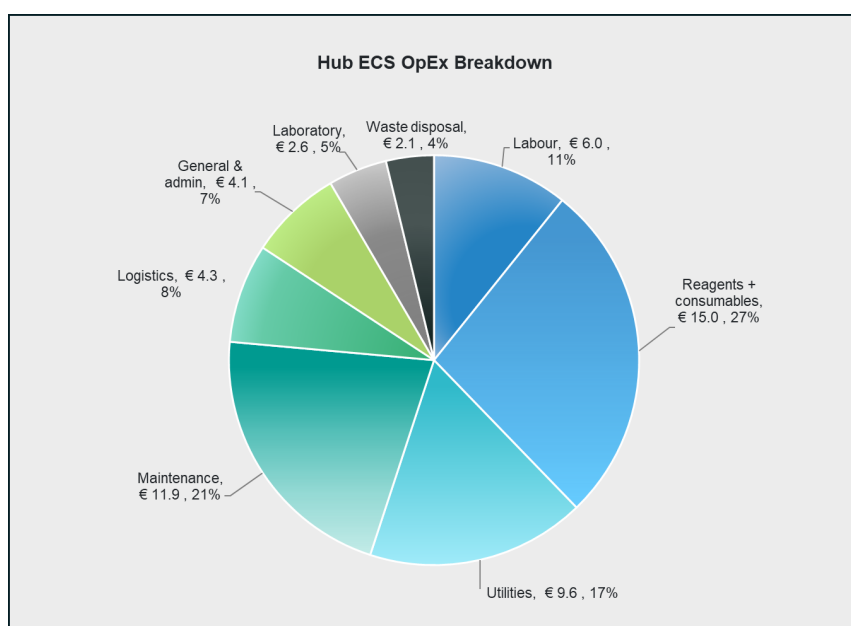


**Figure 8: Hub ECS CapEx breakdown**

\*Note: Other indirects include Commissioning, Mobilisation & Demobilisation, Initial Fills, and Spares.

## Operating Cost Estimates

The Hub ECS OpEx of €56M pa has been estimated to a level of accuracy of +/-25% and assumes Black Mass is transferred across the fence on a "free issue" basis.



**Figure 9: Hub ECS OpEx breakdown**

The four largest OpEx items start at Reagents and Consumables at 27% of OpEx, Maintenance at 21%, Utilities at 17% and labour at 11%. In terms of reagents, Europe is a mature market when it comes to sourcing and supply and various options are available to Primobius. As part of the Hub ECS, reagent suppliers were contacted, and quotes were secured. Maintenance comprises of labour and materials and has been estimated using standard industry heuristics. Electricity dominates in terms of utility costs.

## HUB ECS Schedule/Timeline

Notwithstanding that a Kaiserslautern location is hypothetical at this point, an indicative project execution schedule/timeline encompassing a process plant and equipment package and balance of plant/NPI detailed engineering, permitting, procurement, construction, commissioning, and handover has been developed. The key milestones are listed below:

<b>Final Investment Decision</b>	<b>1/1/2024</b>
<b>FEED Complete</b>	<b>2/8/2024</b>
<b>Permitting Complete</b>	<b>13/12/2024</b>
<b>Commence Construction</b>	<b>10/2/2025 (17 months) – partially in parallel</b>
<b>Commence Commissioning</b>	<b>29/6/2026</b>
<b>Commence Handover to Operations</b>	<b>13/11/2026</b>

Ramp-up of operations is assumed as 25% of design throughput first quarter, 50% second and third quarters, 75% fourth quarter and full 12,000tpa throughput of Black Mass from fifth quarter.

## Risk Management

Industry standard project risk analysis was completed as part of the Hub ECS. The analysis focused on project development and execution with key risks identified as follows:

1. Maintenance of currency/relevance of the Primobius flowsheet and ongoing development and improvement in relation to LiB chemistries, formats etc.
2. Ensuring current and ongoing customer product satisfaction
3. Commissioning process management – time, skills, expenditure, KPI delivery
4. Permitting (partially offset by site selection).

## Hub Products and Marketing/Sales

Primobius has relied upon subscriptions with leading battery market researchers including Benchmark Mineral Intelligence, Fastmarkets and Argus, who provided the battery materials sector forecast prices used within the Hub ECS.

The likely end use of products produced by the Hub are set out in Table 4 below:

Table 4: End product uses

	Product or Waste	Application
1	Hydrated nickel sulphate crystals	Precursor cathode active material ("PCAM") and cathode active material ("CAM") used for LiB cathode manufacture
2	Hydrated cobalt sulphate crystals	PCAM and CAM used for LiB cathode manufacture
3	Lithium fluoride ("LiF") crystals	Lithium hexafluorophosphate (LIPF <sub>6</sub> ) electrolyte for LiBs
4	Manganese sulphate solution	Agricultural fertiliser products and/or PCAM and CAM used for LiB cathode manufacture
5	Copper metal/cathode	Industrial applications
6	Ammonium sulphate crystals	Agricultural fertiliser
7	Graphite/carbon	Bulk industrial graphite applications. Research/collaboration on future use in LiBs being undertaken
8	Al/Fe residue i.e. Goethite	Water treatment applications e.g., Al & Fe coagulants or disposal to landfill as a benign waste

Primobius currently has confidential dialogues underway with numerous prospective buyers/customers of these Hub products. In addition, numerous companies have expressed an interest in evaluating Primobius end products.

The Hub ECS assumes a lithium end product being lithium fluoride, which is used in hexafluorophosphate (LIPF<sub>6</sub>) electrolyte used in most LiBs. Primobius' proprietary recovery process is currently being demonstrated. The LiF process is simpler and lower cost than alternatives. The price per tonne of lithium fluoride has traditionally been an average of 60% higher than the price of battery grade lithium carbonate per tonne.

Primobius' processing flowsheet allows for other lithium end products, namely lithium sulphate, to be produced for subsequent processing to lithium carbonate. In this way, Primobius can cater for different customers' lithium requirements.



Ammonium sulphate whilst the largest end product by quantity/tonnage from the Hub, would constitute less than 1% of annual Western European consumption<sup>16</sup>.

## Integrated Spoke and Hub

Table 5: Spoke and Hub Summary Table

	Metric
<b>1. Throughput/Capacity</b> <ul style="list-style-type: none"> <li>Spoke</li> <li>Hub</li> </ul>	21,000tpa LiB EOL or production scrap (70% modules, 30% cells) 12,000tpa Black Mass
<b>2. End Product</b> <ul style="list-style-type: none"> <li>Spoke</li> <li>Hub</li> </ul>	12,000tpa Black Mass 9,300tpa of hydrated nickel sulphate crystals 4,300tpa of hydrated cobalt sulphate crystals 1,600tpa of lithium fluoride crystals (used in all LiB electrolyte production) With the option to instead produce lithium sulphate for conversion to lithium carbonate based on customer requirements. 7,000tpa of manganese sulphate solution (32% w/w MnSO <sub>4</sub> ) 23,400tpa of ammonium sulphate crystals.
<b>3. Total CapEx</b> <ul style="list-style-type: none"> <li>Spoke</li> <li>Hub</li> <li>Synergies from co-location</li> </ul>	€103.9M <sup>15</sup> (Sept 2022), escalated €274.1M (July 2023) Less €8M <b>€377M<sup>15</sup></b>
<b>4. OpEx per annum</b> <ul style="list-style-type: none"> <li>Spoke</li> <li>Hub</li> </ul> <b>Total including escalation (not taking into account OpEx synergies from co-location)</b>	€25.5M <sup>17</sup> (Sept 2022), escalated €55.5M (July 2023) <b>€82.7M<sup>15</sup></b>
<b>5. Fully integrated Hub and Spoke Costs</b> <ul style="list-style-type: none"> <li>CapEx</li> <li>OpEx</li> </ul>	€377M <sup>15</sup> (+/-25%) including +15% contingency. €83M <sup>15</sup> p.a. (+/- 20%) or €3,937 <sup>15</sup> per tonne of LiB fed into the Spoke per annum.

<sup>16</sup> Argus Consulting Services .April 2021.Strategy Report, Ammonium Sulphate.

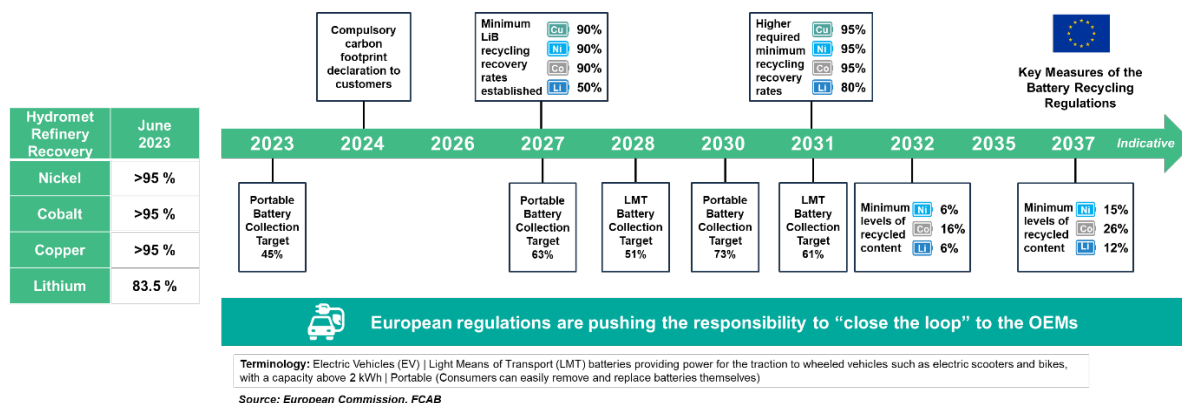
<sup>17</sup> German 12-month inflation: 6.4% (Source: DEstatis, [https://www.destatis.de/EN/Themes/Economy/Prices/Consumer-Price-Index/\\_node.html](https://www.destatis.de/EN/Themes/Economy/Prices/Consumer-Price-Index/_node.html)) and September 2022 €/US\$ F/X 1:1 (source RBC (<https://apps.royalbank.com/apps/foreign-exchange-calculator>))



## Sustainability

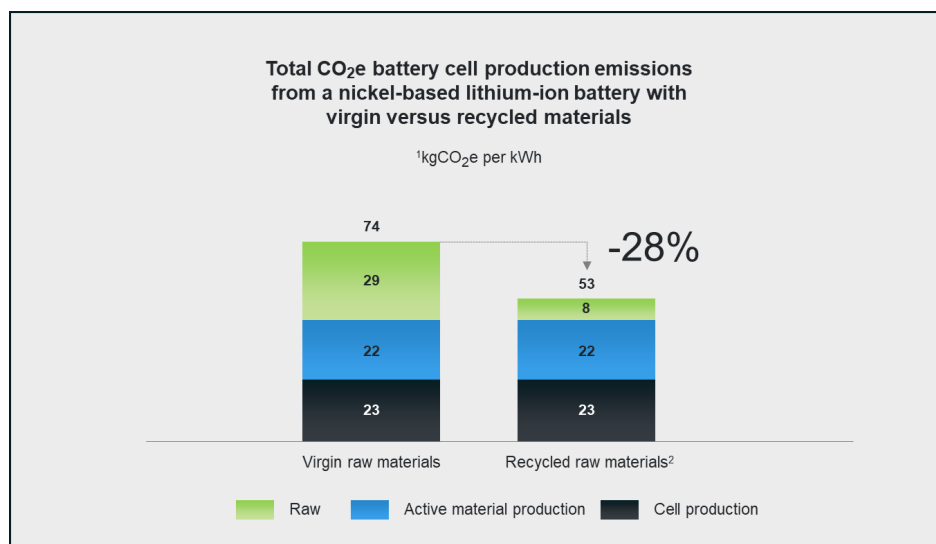
Primobius' process flowsheet is well placed to meet the EU Battery Regulation requirements which will be progressively implemented from 2026 onwards in Europe.

Amongst other things, these regulations will mandate recycling of all batteries placed on the EU market. Once legislated, authorised recyclers will be required to recover at least 90% of contained nickel, cobalt, and copper by 2026, increasing to 95% by 2030. See Figure 10 below:



**Figure 10: European Regulation Driving OEMs to "Close the Loop"**

As set out by McKinsey and Company 2023<sup>18</sup> use of recycled materials can deliver close to a 30% reduction in overall LiB nickel-based cell production emissions, as shown in Figure 11.



Source: McKinsey Battery Insights (2023)  
<sup>1</sup> United States, 2023 Q1. <sup>2</sup> Assuming mechanical pre-treatment and hydrometallurgical recycling.

**Figure 11: Hydrometallurgical refinery (and mechanical pre-treatment) CO<sub>2</sub> equivalent compared to virgin raw materials**

<sup>18</sup> Advanced Industries Practice: Battery Recycling takes the Driver's Seat, McKinsey and Company, March 2023

A third-party peer-analysed Life Cycle Analysis (LCA) review for the integrated Spoke and Hub is underway by a suitably qualified expert consultant and will be completed by the December 2023 quarter.

## Next Steps

Indicative timeline for Primobius, within the Neometals portfolio is shown in Figure 12 below:

**Figure 12: Milestones and indicative timelines**



\* Subject to Primobius GmbH and Neometals Limited Board of Directors Approvals

\*\* Subject to PO issue by Mercedes ("MB")

## Forward-looking Statements

*This release contains "forward-looking information" that is based on the Company's expectations, estimates and projections as of the date on which the statements were made. This forward-looking information includes, among other things, statements with respect to studies, the Company's business strategy, plan, development, objectives, performance, outlook, growth, cash flow, projections, targets, and expectations. Generally, this forward-looking information can be identified by the use of forward-looking terminology such as 'outlook', 'anticipate', 'project', 'target', 'likely', 'believe', 'estimate', 'expect', 'intend', 'may', 'would', 'could', 'should', 'scheduled', 'will', 'plan', 'forecast', 'evolve' and similar expressions. Persons reading this news release are cautioned that such statements are only predictions, and that the Company's actual future results or performance may be materially different. Forward-looking information is subject to known and unknown risks, uncertainties and other factors that may cause the Company's actual results, level of activity, performance or achievements to be materially different from those expressed or implied by such forward-looking information.*

*Forward-looking information is developed based on assumptions about such risks, uncertainties and other factors set out herein, including but not limited to general business, economic, competitive, political and social uncertainties; the actual results of current development activities; conclusions of economic evaluations; changes in project parameters as plans continue to be refined; future prices of metals and other commodities; failure of plant, equipment or processes to operate as anticipated; accident, labour disputes and other risks of the chemical industry; and delays in obtaining governmental approvals or financing or in the completion of development or construction activities. This list is not exhaustive of the factors that may affect our forward-looking information. These and other factors should be considered carefully, and readers should not place undue reliance on such forward-looking information.*

*Neither the Company, nor any other person, gives any representation, warranty, assurance or guarantee that the occurrence of the events expressed or implied in any forward-looking statement will actually occur. Except as required by law, and only to the extent so required, none of the Company, its subsidiaries or its or their directors, officers, employees, advisors or agents or any other person shall in any way be liable to any person or body for any loss, claim, demand, damages, costs or expenses of whatever nature arising in any way out of, or in connection with, the information contained in this document. The Company disclaims any intent or obligations to or revise any forward-looking statements whether as a result of new information, estimates, or options, future events or results or otherwise, unless required to do so by law.*

## Advice

*Nothing in this document constitutes investment, legal or other advice. Investors should make their own independent investigation and assessment of the Company and obtain any professional advice required before making any investment decision based on your investment objectives and financial circumstances.*

Authorised on behalf of Neometals by Christopher Reed, Managing Director.

## ENDS

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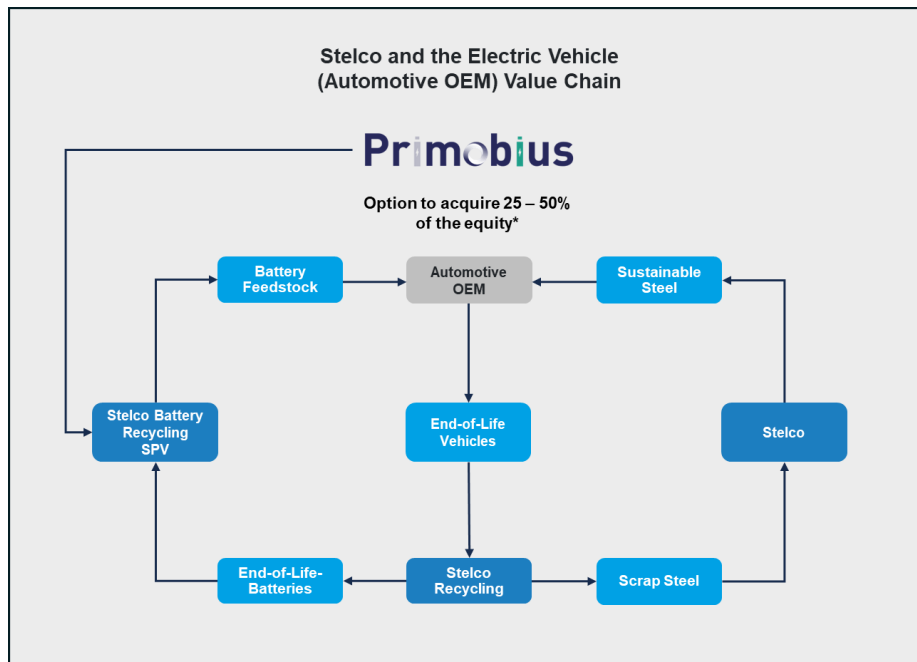
### About Neometals Ltd

Neometals is an emerging, sustainable battery materials producer. The Company is commercialising three environmentally-friendly processing technologies that will primarily produce lithium, nickel, cobalt and vanadium at lowest quartile costs with minimal carbon footprint.

Neometals' and its partners have been recognised internationally for sustainable approaches that combine industry leading costs with circular economic principles, reducing the reliance on traditional upstream mining-based supply chains. The Company's three core business units are commercialising these proprietary technologies in incorporated joint ventures:

- **Lithium-ion Battery ("LIB") Recycling (50% technology)** – providing recycling as a service, plant supply under JV, or technology licensing business models via Primobius GmbH (NMT 50% equity). All plants built by Primobius' co-owner (SMS group 50% equity), a 150-year old German plant builder with 14,000 employees.
- **Primobius is recycling technology partner and plant supplier to Mercedes-Benz.** Commercial 10tpd shredding 'Spoke' facility operational in Germany and investment decision for Primobius' first commercial 50tpd plant with Stelco in Canada expected Q4 (NMT 25% equity).
- **Vanadium Recovery (100% technology)** – aiming to produce high-purity vanadium pentoxide from processing of steelmaking by-product ("Slag"). Planned 9,000tpa operation in Pori, Finland (NMT 72.5% equity) courtesy of 10-year Slag supply agreement with SSAB. Investment decision with JV partner, Critical Metals, expected Q3 2023. MOU with H2Green Steel for potential second, larger operation in Boden, Sweden; and
- **Lithium Chemicals (70% technology)** – aiming to produce battery quality lithium hydroxide from brine and/or hard-rock feedstocks using patented ELI™ electrolysis process co-owned 30% by Mineral Resources Ltd. Co-funded Pilot Plant trials Q2/Q3 2023 and Demonstration Plant trial H1 2024 preceding potential commercial operation with Bondalti Chemicals in Portugal.

## Appendix 1



**Figure 13:** Diagram showing relationship between Stelco and the Electric Vehicle (Automotive OEM) value chain