RESEARCH REPORT

CORPORATE CONNECT

Magnis Energy Technologies

A green battery cell technology play from end to end

Share Price & Estimated Future Price		
	Price in 12-months*	$1.34
	Current Price	$0.45
	Implied Change	+198%

Magnis Energy Technologies (MNS.ASX) and un-listed green tech company C4V is developing **iM3NY**, a battery cells Gigafactory in New York State, where semi autonomous battery production will soon commence. The plant, which could be fully autonomous by mid 2022, will embrace Big Data, AI and smart automation to push down the cost of making some of the world's greenest batteries. Technology risk is low as C4V's proprietary battery cell chemistry has been qualified by ~60 parties and is part of the supply chain for the US Department of Defence and the US Department of Energy. Key risks include execution and scaling risk. However, the CEO of **iM3NY** was a senior member of the team, which brought Giga Nevada on line. **iM3NY** is presently ~40% complete, on schedule and under budget. Capacity plans include 32GWh by 2030. We ramp **iM3NY** at a slower pace for valuation purposes.

Debt funding at the asset level is likely through low cost Government loans, grants and syndicated senior debt. MNS (**iM3NY** ~60%) is fully funded to the start of 2022. Beyond that, MNS may consider dilution at the asset level to attract the right partner and reduce its equity commitments. With the US importing 100% of its anode and cathode materials; and 90% of its battery cell requirements, **iM3NY** could be well placed to meet a substantial market opportunity, supported by the US Infrastructure Bill and several state policies, such as New York State's mandate that new car sales from 2030 be all EVs.

How can iM3NY compete with the big guns? Firstly; the Gigafactory's high power usage is fuelled 100% by abundant low cost hydro from Niagara Falls at <US$0.05c/kWh secondly; the unique phosphate rich cells are free of expensive nickel and cobalt and thirdly; the cell's high 3.9V (volts) provides power and supports high energy density. This is important, as the longer the cell life the lower the carbon cost/unit of energy produced and the lower the annual degradation rate/kWh. In summary, the longer the cycle life the fewer batteries are required over time and the longer ones vehicle retains its value.

Part of the US Defence supply chain – **iM3NY** has stated publically that it is part of the supply chain for the Department of Defence and is working with several large US corporations. This claim is confirmed with a small contract with Maritime Tactical Systems (MARTAC) for autonomous boats, which they sell to the US Navy.

US Infrastructure Bill signed supports EV ecosystem – Funding is a challenge for new technology However, with the signing of the US$1.2Trillion Infrastructure Bill, the US Government now has US$80Bn to support the development of a US based electric ecosystem through grants, low cost loans, tax credits and other incentives. This support is necessary to shift the China centric EV supply chain to "Made in the USA", thus creating new US jobs. BAE Systems is working with the US Department of Energy (DOE) and Consolidated Edison (Con Edison) to test C4V cells for use in school buses, electricity grids and the military. A huge potential opportunity for **iM3NY**, with the electrification of 500,000 Government buses now approved.

Valuation upside mirrors EV demand – MNS is the only listed participant in the US based **iM3NY** battery cell Gigafactory (MNS ~60%). We model cautiously by risking our value for **iM3NY** by 0.34x. As our model de-risks, the 12-month target price will increase. The key mid-term driver for MNS, is our two phase expansion of **iM3NY**'s production capacity in New York State. Each of our two phases is risked under 3 separate scenarios. Under scenario-1, using a blended NPV10 and an EV/EBITDA multiple of 12x, our 12-months target prices is $1.34/share (or US$0.96/share). With execution of catalysts and time, the arbitrage between the markets model and intrinsic (DCF based) value should close. If **iM3NY** can execute on its growth strategy, then de-risking could see the 4-year value rise beyond $3.50/share (refer page 27-29). A listing of **iM3NY** in the US could support this outcome.

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MNS Company Information	
ASX Ticker	MNS
ASX Price (/share)	A$0.45
52-week Range (/share)	A$0.14-$0.76
Position Relative to 52-week High``	-41%
OTC Ticker	MNSEF
OTC Price (/share)	US$0.36
Shares on Issue	967.4m
Fully Diluted Shares on Issue	1,098.1m
Market Capitalisation	A435m

Source Factset

MNS MARKET MODEL versus INTRINSIC MODEL I		
Current Market Capitalisation	A$m	435
-Cash	A$m	99
+Debt	A$m	69
Current Enterprise value (EV)	**A$m**	**405**
Current Intrinsic Value (dcf based)	**A$m**	**1,353**
Net Cash % market cap	**%**	**7.0%**

Source: Corporate Connect Research

MNS Board & CEO	
Frank Poullas	Executive Chairman
Prof. Stanley Whittingham	NED
Mona Dajani	NED
Zarmeen Pavri	NED
Mugunthan Siva	NED
Peter Tsegas	NED

Source: Magnis Energy Technologies

MNS PRICE Chart

Source: Factset

MAGNIS ENERGY TECHNOLOGIES

Company Summary – Greener, safer, lower cost batteries

Improving the lithium ion battery

Lithium-ion batteries (LIBs) work well and solid-state batteries (SSB) will likely be better but will take time to scale in a rapidly growing market. So why bother with an alternate LIB chemistry…why not just wait for SSB? The issue is EV costs need to come down to encourage the broader population to switch-out their internal combustion cars and Nickel Manganese Cobalt (NMC) cathode chemistries, whilst very effective are expensive and not as safe as could be. The bottom line is – to wait for SSB means current demand forecasts are potentially unreasonable and of course we all know what this means…long live fossil fuels! This is a real risk as metal precursors struggle to meet 10x EV demand by 2030 and prices rise to reflect this reality. Something may have to give and EV demand destruction is not what we want. Thus, it is possible, that the timing is absolutely right to introduce another LIB chemistry and one that can act as a lower cost/higher power bridge to capital-intensive SSBs.

It just takes time…LIB was launched 28 years ago, Lithium Phosphate 24 years ago and C4V's proprietary nickel and cobalt free, high voltage **Bio Mineralised Mixed Metal Phosphate Composite (BM–LMP)**… almost 10 years ago.

An EV has a direct current (DC) battery with two electrodes. In a lithium ion battery, the anode is the oxidative and thus negative electrode and the cathode is the reducing thus positive electrode. The anode is made up of graphite. C4V has patented new cathode chemistry, which is both nickel and cobalt free.

The C4V phosphate cathode cell chemistry is comprised of a Bio Mineralised Mixed Metal Composite, which is cheaper, safer, greener and more energy dense than the average nickel & cobalt rich NMC cathode cell chemistry.

The electrolyte is the medium that helps the lithium ions move from one electrode to the other during charge and discharge cycling. C4V has a patented semi-solid electrolyte that is currently being qualified and could be on line by 2027.

Investment thesis – using a local by-product to synthesise a cleaner high performance anode material

iM3NY's main stakeholders are C4V (~38%) and MNS (direct & indirect @~60%). **iM3NY** battery cell Gigafactory is due to start semi autonomous pre-production by the end of 2021 and will be **the first independent battery cell producer in the US**. This hasn't happened over night – it's been almost 10 years in the making. Why so long? Well this is a story about inventing a disruptive technology and finding the perseverance to convince others of its value by creating a deep channel to market, which in this case is the US based **iM3NY** battery cell Gigafactory in Endicott, New York State. C4V also has plans for a next generation SSB using proprietary technology. Undergoing a lengthy qualification after lighting up a LED light in 2018.

Recent notable corporate announcements;

- C4V Selected in United States Government Funded USCAR Program (Nov '21)
- Aquifer Permit Approved for NY Lithium-ion Battery Plant (Oct, '21)
- Air Permit Received for New York Lithium-ion Battery Plant (Oct '21)
- North American Trading in Magnis Shares (Sept '21)
- Magnis Bolsters Management Team (Sept, '21)
- New York Lithium-ion Battery Plant Update Binding Sales (Aug '21)
- Magnis Secures A$20m from US Institutions (Aug '21)

Catalysts - timeline *(source Corporate Connect Research)*

Pre-production expected to start before end 2021

iM3NY (MNS ~60% in total) – Will be the US's first "home grown" battery cell Gigafactory

- **China effectively controls the price of a US EV –** The US has NO graphite production and imports 100% of its anode, 100% of its cathode and 90% of its battery cell requirements. Furthermore, China accounted for 72.5% of global LIB capacity, compared to the US at 9.2% and Europe at a mere 5.4%. It is clear, China controls the supply chain for battery manufacturing and its stated goal to reach 25% of global EV sales by 2025, could result in reduced export volumes globally and thus; poses a significant risk to both price and supply; and thus the build-out of EVs in the US.
- **iM3NY (MNS 60%) will be the first independent battery manufacturer in the US –** From EV; to consumer electronics; to energy storage systems, the demand for LIBs is surging and to reduce the 90% import dependence referred to above, there has been a rush of US battery cell Gigafactory announcements recently. However, only one qualified battery cell producer, which is "Born in the USA", will start production in coming weeks. **iM3NY** is developing a 1GWh pilot line in Endicott New York State, to demonstrate and test its high voltage BM–LMP technology and stakeholders have ambitions for 32GWh of capacity by 2030. Like Northvolt in Europe, C4V plans a rapid build out. India is a target market, with initial cell qualifications and contracts made and partner discussions underway.
- **High voltage, high energy density and fast charge capability –** These nickel and cobalt free BM-LMP cathode cells are already commercially available and run at 3.9V, compared to 3.7V for NMC and 3.2V for LFP cathode chemistries. The cells higher voltage supports a high fast charge capability, high energy density of 190+Wh/kg with a pathway to 230Wh/kg and long cycle life (>5,500cycles). This is a key differentiator, as NMC cells dissipate current quite fast, which can reduce voltage and hinder fast charge capability. C4V suggests its Bio Mineralised Phosphate rich technology can improve the voltage of the NMC cell and consequently, forms the basis of its 2nd generation N-series cells from 2024.
- **USCAR is a collaborative automotive technology company –** comprised of Stellantis, Ford and GM. These are 3 big US auto OEM's that you certainly want to be associated with. The DOE recently awarded a grant to American Battery Technology Company to recycle cells. Cell maker BASF will make cathode from the recycled product and C4V will build the cells and compare these with their BM-LMP cathode chemistry. The OEM's will then proceed to qualify the cells. CCR considers cells from the **iM3NY** Demonstration plant might feed into the USCAR supply chain. This is a quite a big deal.
- **New York State supports batteries green status – iM3NY** is located 343km by road from Niagara Falls and consequently has access to the lowest cost energy in the US. It also has access to the world's largest financial capital, which ranks world #2 for its technology ecosystems. Although, ~1% of new car sales in New York State are EVs, all new car sales from 2035 will be EVs. It seems **iM3NY**'s timing looks perfect for stakeholders MNS and C4V.
- **Manufacturing Roadmap supports solid-state cell by 2026 –** C4V plans to bring its SSB technology to market late 2026. A working prototype was presented, in a prismatic cell format in 2018, at the NYBEST conference and C4V could have samples ready for qualification in 2023. An energy density of 400Wh/kg is being targeted, which supports a very long cycle life. **iM3NY** competitors have had their SSB product validated by auto OEM partners and until **iM3NY** receives validation, we remain cautious and consequently have not modelled the opportunity to date. Clearly, if C4V can deliver this technology, the value proposition would be truly significant.

Global EV Supply & Demand – A Megatrend; 10x Growth by 2030 and 30x Growth by 2040

- **BMI suggests EV penetration could reach 6.6% of global sales in 2021**
- **Global battery EV sales could be +70% in 2021 and total (incl. plug-ins) could be +100%**
- **US needs to hurry on as EV market penetration is only 2.3%; and**
- **Rising demand for e-mobility is being driven by surging demand for e-scooters and e-taxis**

It is clear in the short to medium term; there is a paradigm shift to the e-mobility megatrend brought about by Environmental and Social Governance (ESG) and clean tech investments and the desire to localise supply chains in the shortest time possible. These powerful and concurrent drivers are being enabled by policy support and legislative changes that is supporting the development of disruptive technologies across the entire battery supply chain.

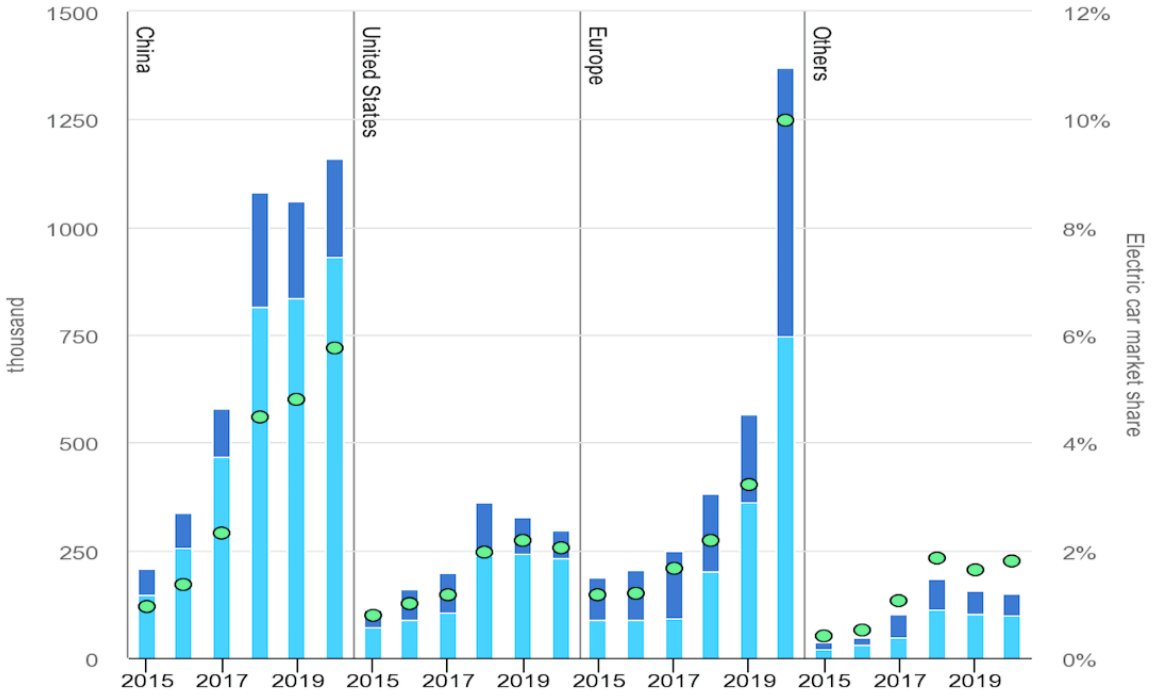
2021 has been a strong year for battery EV sales with forecasts suggesting that end of year sales could be up ~70% on 2020 levels, whilst if plug-in hybrids are included in total EV sales - forecasts sales could be up ~100% on 2020 levels.

It seems we are at the cusp of generational change and if the BNEF report titled **'Electric Vehicle Outlook 2021'**, is considered, global passenger forecasts for plug-in EV annual sales could rise strongly from 3.1m in 2020 to 14m in 2025**, 30m in 2030** and **65m by 2040.** This would increase the global EV inventory from 12m today to 56m by 2025 and 170m by 2030. This represents huge growth of 158m EVs or 13x in less than 9 years.

However, it gets worse. Under a zero emissions target scenario to 2050, run by BNEF for the first time, it sees 218m passenger EVs required by 2030 to ensure the 2050 zero emissions target can be met. That is a massive growth of 17x!

In this context, BNEF suggests the global EV segment could represent a US$7Trillion market opportunity by 2030, growing to US$46Trillion by 2050 - this is unquestionably a systemic megatrend. The rub here, unfortunately, is that from a battery perspective, it is not just EVs that are going electric. There will be continuing demand for electronics, trucks, commercial vehicles and long-life storage systems. Such is the challenge for some and the potential reward for others.

IEA Global EV Sales Outlook 2021 **US EV Penetration is actually quite low; compared to China & Europe**



Source: IES Global EV Sales Outlook 2021

EVs in the USA – currently imports 100% of anode and cathode materials requirements

- **US LIB capacity was 42GWh at end 2020; sales were sluggish and fleet size remains low**
- **High growth potential with localisation of supply chains; EV costs approach parity with ICE**
- **Expected to pick up more grants and Government loans to fund substantial growth**

The global trend towards EVs in 2020 was also evident in the US, where EV sales rose by 4% to 0.3m units, whilst total passenger car sales declined by 15%. However, with a US EV fleet size of only 1.8m and a population of 330m, there is much work to be done. Clearly, building supply chain resiliency is becoming a priority, as the greater demand is for EVs within China, the greater the risk that its anode, cathode and battery-cells are NOT available for export to the US.

BMI explained it well; '***China is building one battery Gigafactory a week, the US one every four months'***. The US has little supply chain resiliency and that is its vulnerability.

How does China compare with the US? In 2020, China's EV sales increased 12% against just 4% in the US. Looking at battery capacity, China accounted for 72.5% of LIB capacity, against the US at 9.2% and Europe at just 5.4%.

How resilient is the US? The US presently imports 100% of its natural and 100% of its synthetic anode powders, as well as 100% of its cathode powders and 90% of its battery cell requirements.

Is there time to secure local supply chains? The bottleneck is the time and cost it takes to develop locally grown battery materials and batteries; a problem as the US has no graphite, nickel, cobalt and very little lithium production. Development can take 5-10 years and building scale through the chain even longer. Already, C4V has been working on monetising its battery BM–LMP cell technology for nearly 10-years.

In 2021, the US has the following 5 battery plants in production:

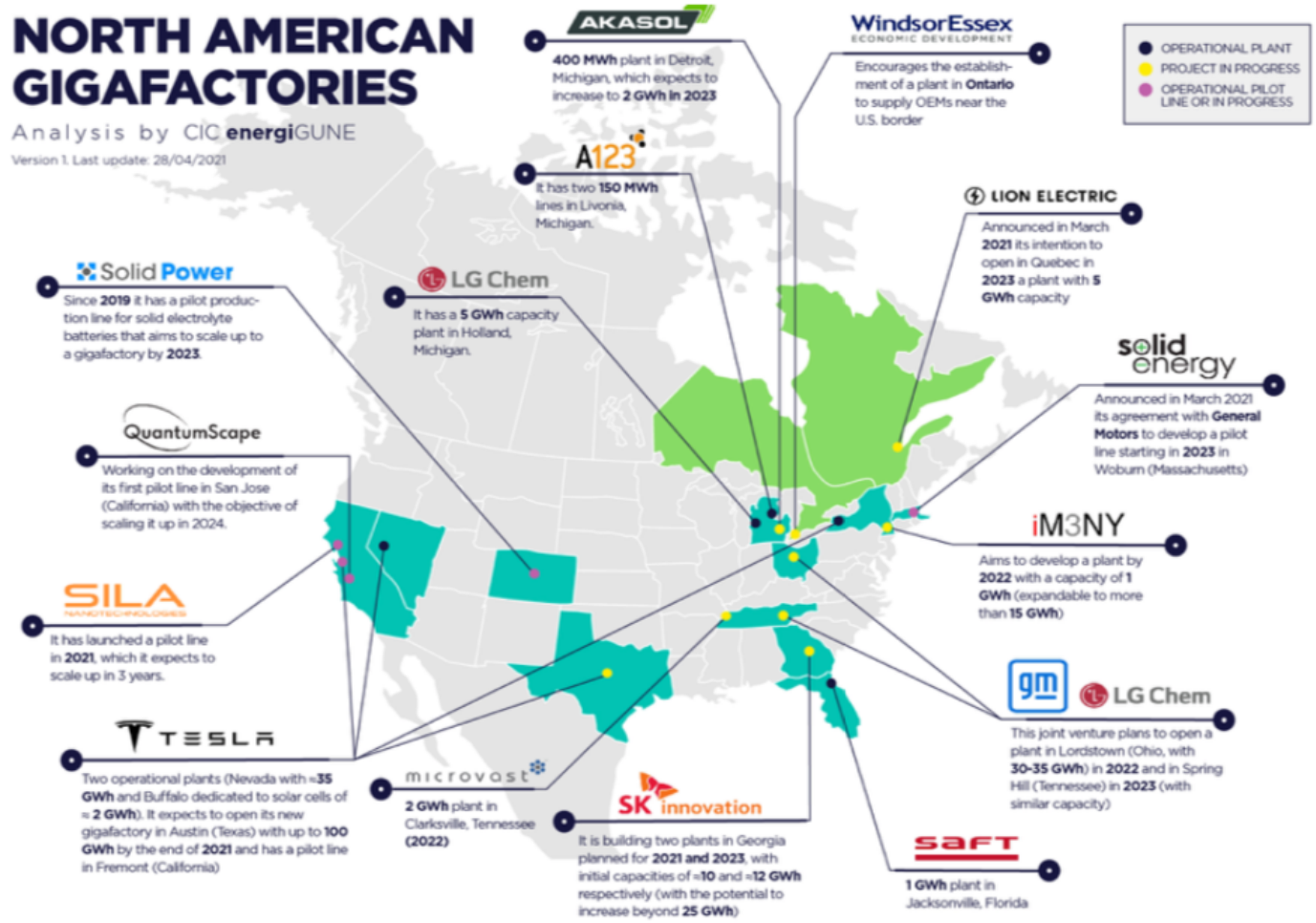
- Tesla auto Gigafactory (Sparks, Nevada)
- Tesla Pilot Plant (Fremont, California)
- Envision AESC (Smyrna, Tennessee)
- LG Energy Solution (Holland, Michigan); and
- SK Innovation (Commerce, Georgia).

To meet forecasts, the US is building-out its EV battery ecosystem across 3 battery hubs:

- **Hub 1**: Tesla West
- **Hub 2**: New Detroit (**iM3NY** battery Gigafactory is located in this hub); and
- **Hub 3**: EV South (includes Tennessee, Alabama and Ohio).

Battery Cell Gigafactories planned	Nationality	State	Strategic Partner	Max Capacity GWh	Start Date
iM3NY	USA	New York	?	32	1H22
Kore Power	USA	Arizona	Lucid	12	2023
LG Solutions	Sth Korean	Tennessee	GM	35	2023
LG Solutions	Sth Korean	Ohio	GM	35	2H23
LG Solutions	Sth Korean	NA	Stellantis	40	1H24
Samsung	Sth Korean	Texas	Stallantis	23+	1H25
Sk Innovations	Sth Korean	Tennessee	Ford	43	2025
Sk Innovations	Sth Korean	Kentucky	Ford	86	2025
Sk Innovations	Sth Korean	Georgia	Ford & VW	21.5	2022
Panasonic	Japanese	Nevada	Tesla	35	2016
Panasonic	Japanese	Texas	Tesla	35	1H22
Total				**374.5**	

Big rush on Gigafactory announcements in 2021; still more required… iM3NY fits in nicely



Townhall Meeting – May 18,2021

Biden Administration signs infrastructure Bill – Plenty of support coming for EV ecosystem

- **US$1.2Tn to boost domestic EV supply chains**
- **30% manufacturing tax credit**
- **Grants and low cost Government loans to light up the space… iM3NY well placed to benefit**

The Biden Administration has just signed the $US1.2Tn infrastructure bill containing more than $80 billion to advance the clean energy transition. The bill contains US$6Bn for DOE grants; US$3Bn for battery manufacturing and recycling and a further US$8Bn has been put aside to fund a 30% manufacturing tax credit for investment in facilities that make or recycle energy products.

The existing and previously congressionally approved has **US$17Bn of ATVM loan authority** at its disposal for manufacturers of advanced technology vehicle battery cells and packs for re-equipping, expanding or establishing such manufacturing facilities in the United States. To receive funds, detailed due diligence occurs. Any significant loan or grant from the US Government would be seen as a huge vote of confidence.

- In the U.S., LMC Automotive expects about a third of new vehicles sales in the U.S. to be EVs by 2030
- LG has partnered with GM, Ford with SK Innovations and Panasonic with Tesla.
- According to the DOE, Panasonic sold 70.9% of the battery cells in the US in 2020
- Toyota has announced plans to lift EV sales in the US from 25% today to 70% by 2030. By spending US$3.4Bn
- We wonder will it partner with an OEM or will it chose to lease its technology to a battery cell maker?

The Biden Administration has declared a ***"clear emphasis on a low-carbon or zero-carbon future."*** It is seeking to align with Europe's mission for the first time in many years, however further policy support will be required across Government and through the battery supply chain. The US$174Bn Infrastructure has just been signed but the passage of the US$555Bn EV pledge through Congress is uncertain. To date, the US President has pledged to:

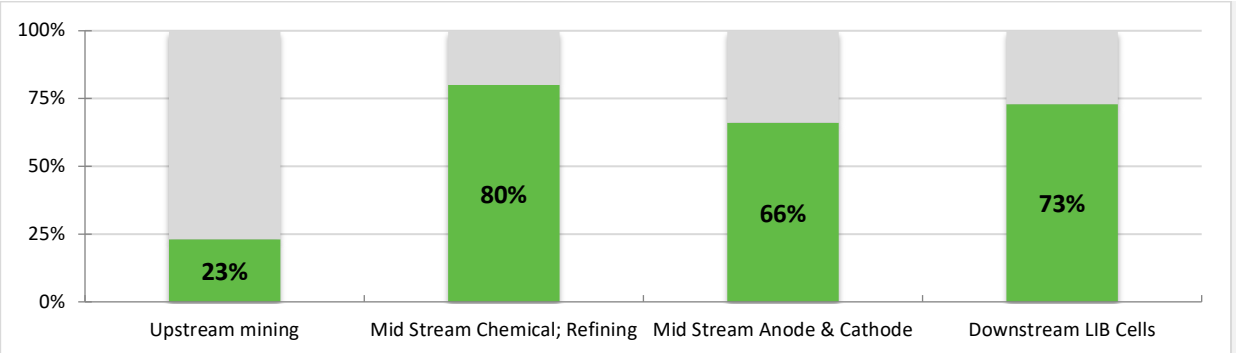
- Convert the 650,000 Government-owned vehicles to EVs
- Convert 500,000 school buses into EVs made in the USA
- Invest US$5Bn into battery research and build 500,000 charging stations by 2030; and
- Commit to carbon-free electricity by 2035.

In a clear showing of what can happen when policy support aligns with customer needs, GM announced the very next day it would ban the sale of new ICE vehicles by 2035 and commit US$27Bn to bring 30 new models to market and by the end of that week, carmaker Ford revised upwards its investment from US$22Bn by 2023 to US$30Bn by 2025. Further, VW recently announced plans for 50% of its US sales to be electric by 2030.

Whenever a supply chain is controlled by a monopoly or foreign country, the greater the supply and price risk to the third party. Managing exposure risk to China is paramount and the localisation of supply chains is key to achieving this.

With the recent superconductor saga and concern over meeting ever growing EV demand, diversification and the need to simplify supply chains is critical. With the US importing 100% of its EV battery grade anode and cathode, it is determined to change this dynamic and in so doing create jobs for American workers, while supporting the Biden Administration's goals for electrification and decarbonization.

China has a clear advantage over all in the strategic lithium ion battery space



Source: White House – 100-Day review under executive order 14017

MNS, with its technology partner C4V and manufacturing partner **iM3NY**, is positioned well to capitalise on the need to ensure there are commercial and scalable quantities of battery cells to meet industry forecasts for EVs. Solid-state batteries still have performance hurdles to clear. However, when that job is done, scaling up to meaningful quantities could take another 5 years. We expect **iM3NY** to be in the mix here with its semi-SSB as well as all SSB.

It is clear, the EV industry can't wait for SSB to become commercial at scale, primarily due limited supply of anode pre-cursors (i.e. lithium metal anode); it must move forward with a graphitic anode and liquid electrolyte; in the most sustainable way possible. The same applies to the cathode; although carbon is not in the cathode the precursor metals often carry their own trail of carbon. Each link in the mining and processing chain must take responsibility to do better.

Investors should be looking at companies who are bringing new mining and processing technologies to market, which better enable the EV to compete with the ICE, not just on a price basis but at a socially-conscious level as well.

Graphite for the anode – there is no other scalable, commercial anode option at this time

Graphite is the anode material in current LIB chemistry and is the single largest component by weight. The anode, or the negative electrode, contains up to 95% graphite derived from either natural or synthetic origins.

In order, Turkey, China and Brazil have the largest reserves of graphite and yet 68% of global graphite production occurs in China and is then processed into 100% of the world's high-grade spherical graphite. With access to vast coal and petroleum coke it also makes 68% of the world's synthetic graphite. In total, China's share of global anode materials production sits at a jaw-dropping 87%.

It is obvious China sets global prices and with graphite a central tenant of EV, storage, iPhone and tablet batteries, it is no surprise that the US and Europe, which both import 100% of their anode and cathode requirements from China, include their associated precursor materials in their critical elements list. China's cathode market share is still material at ~60%.

Natural graphite is mined carbon and often associated with impurities requiring purification to yield high quality battery-grade graphite with a purity of 99.95%. MNS has a 100% owned high quality graphite project in Tanzania and has plans for some time to produce graphite concentrate. Timing has been against them…maybe that will change. MNS does have a patent with C4V to use its advanced coating technology in North America (Refer pages 8 for more details).

In North America there is one operating graphite mine in Quebec, however the mine is nearly depleted. There are a few new vertically integrated mine/anode projects in Canada and the US, which are under consideration. However, the path to qualification and production is often long and product performance, in most cases, remains unknown. To adhere to the US Government's *"Made in America"* policy, a big focus on graphite will be necessary as it makes up to ~20-25% of the EV battery by weight and as suggested by both BNEF and BMI, will remain the dominant anode chemistry for the next decade.

Lithium Iron Phosphate (LFP) usage is growing setting the stage for iM3NY's Phosphate rich technology

- **LFP cells are free of expensive nickel and cobalt but have low voltage and cycle life**
- **BM–LMP energy density sits between NCM and LFP; and**
- **BM–LMP voltage is higher than either NCM and LFP**

After using Lithium-Iron-Phosphate (LFP) cell chemistry in its Shanghai factory, Tesla announced at its recent quarterly that it would be switching out its Nickel Cobalt Aluminium (NCA) cathode chemistries for LFP in its short range/entry level EVs. This is a significant change and likely to see demand for LFP cathode chemistry's increase further. The attraction of LFP is price, and price is ultimately what is going to get the broader population using EV's. The issue with LFP however, is that it is good for short-range only and its voltage is low. So, for the average American with a truck, it will not work. Enter BM–LMP. Its voltage of 3.9V is higher than NMC at 3.7V and 3.2V for LFP. The result is – extra battery cell power for lower cost.

BMI reports that Chinese company Gotion, has developed cells with energy density of 210Wh/kg up significantly from standard LFP at ~130Wh/kg. This is fabulous news for **iM3NY** as its high voltage cells, based on BM–LMP chemistry, can deliver an energy density of 200Wh/kg with a clear path to 230Wh/kg in the short term (refer page 8). Benchmark Minerals Intelligence (BMI) considers that LFP could comprise ~22% of supply in 2030 up from 17% forecast the quarter before. The shift to phosphate looks structurally sustainable. With the start up of pre-production of the **iM3NY** plant by end 2021 and samples then being delivered to customers for testing; the timing for **iM3NY** stakeholders and its phosphate rich chemistry looks perfect.

C4V – MNS holds 9.65% in US battery tech innovator

- **First US factory announced in 2019…now due to start production shortly; and**
- **Will bring the greenest and safest battery to market; and**
- **Cells with highest voltage and lowest cost**
- **Non Asian supply chain – made for the times**

The main stakeholders in iM3NY Gigafactory are C4V (~38%) and MNS (~60%*) and MNS also has a 9.65% interest in C4V.

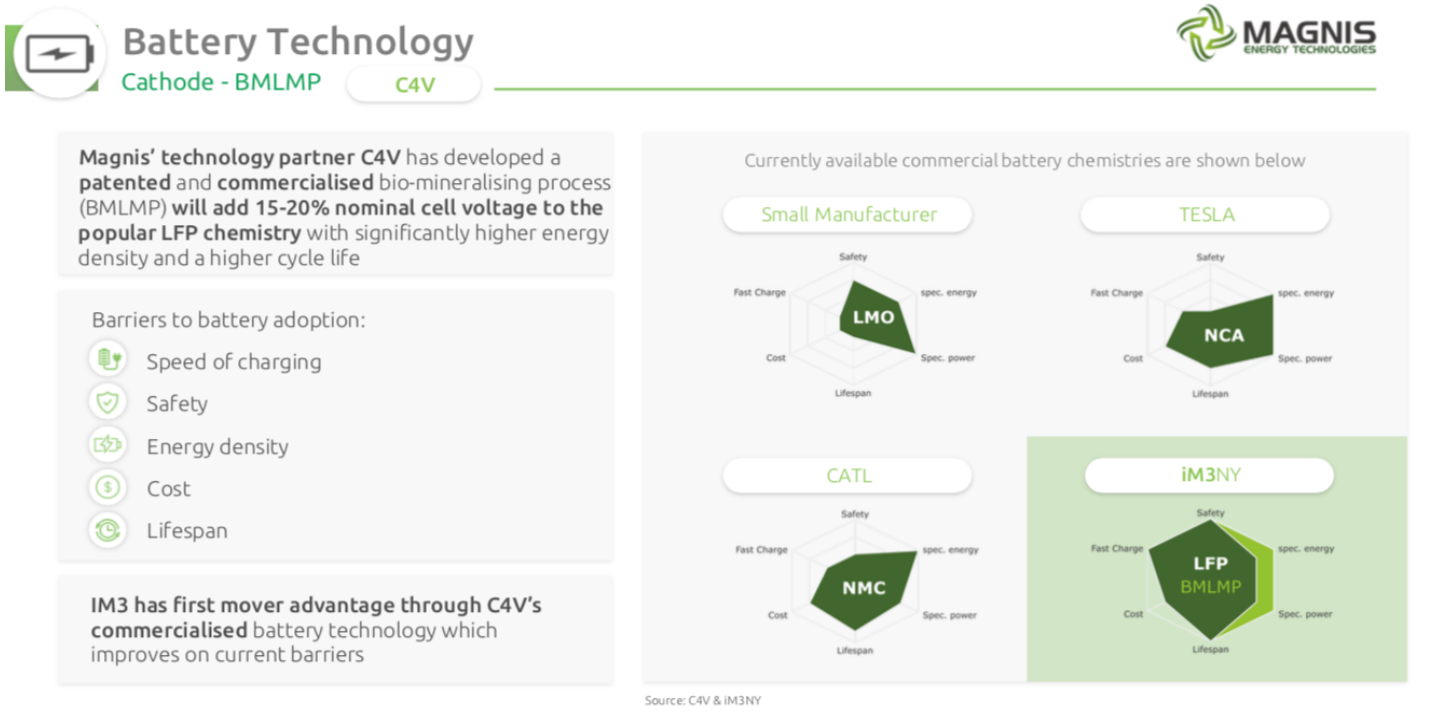
C4V, is an unlisted R&D battery cell technology company located in Binghamton, New York State and was founded by Dr Upreti in 2014. No better place to start this journey other than at Binghamton University, where Dr Upreti graduated under the guidance of Dr Stanley Whittingham, an inventor of the LIB and Nobel prize laureate.

C4V's focus is on using artificial intelligence and automated technologies to efficiently and sustainably manufacture its advanced LIB technology. Timing with its high voltage phosphate rich cell chemistry looks to be perfect, as Tesla raises its Model 3 prices for the second time in a month. Interest in the cheaper LFP cells is growing and this should be good news for MNS stakeholders as C4V's BM–LMP cell sits between NMC and LFP in terms of energy density & cost. What is there not to like?

Further, BM–LMP has already been qualified by an unnamed but reportedly "influential" US Government contractor and is already part of the supply chain for the US Department of Defence and the US Department of Energy. C4V has provided LIB cells to;

- **The DOE** – for a hybrid solar plant located in New York State
- **MARTAC** – a supplier of autonomous electric boats for the US navy; have been in operation now for ~2-years
- **The DOE** – to build a hybrid grid for DOE using battery cell technology. NYSERDA working with the utility; and
- **New York buses** – Demonstrating BM–LMP tech and fast charge capability for the buses, working with Edison Consolidated & BAE Systems; a top supplier of military systems & batteries to the US military. The program is funded by the New York State Energy Research & Development Authority (NYSERDA).

Lifecycle assessment was carried out by renowned Abt Associates and funded by NYSERDA. The report suggests the cells are some of the greenest in the world having 85% of the carbon footprint and twice the cycle life of most commercial cells.



ASX:MNS

**** Includes direct & In-direct equity interest***

Phosphate Rich Battery Cell Technology

- **High voltage – Bio mineralised lithium phosphate based composite metal cathode**
- **Safer batteries – reduced need for pack level safety devices**
- **Greenest batteries – independently audited by Abt Associates**
- **Qualified by the US navy, the US Department of Defence and the US Department of Energy**

C4V has patented a unique cathode chemistry called Bio-Mineralised Lithium-mixed-Metal-Phosphate (BM-LMP). The battery cell uses a traditional electrolyte and a proprietary anode material process to produce a fire resistant and low toxicity cell, which will be incorporated into **iM3NY** P-Series Generation-1 battery cells.

The first IP patent was filed in 2012 and patent protection was awarded in 2017. C4V holds a rare Composition of Matter patent, which covers the product itself. In this case the patent is the molecule itself. This type of patent apparently is preferred by the pharmaceutical industry and is the most difficult of patents to receive; representing only 0.5% of all approved patents. This type of patent awards ownership of the molecule that makes up the composite metal to C4V. To protect C4V's IP, **iM3NY** uses an in-house spectrometer, which can detect a patent infringement within 15 seconds of cell testing. The current patent is active in ~35 countries.

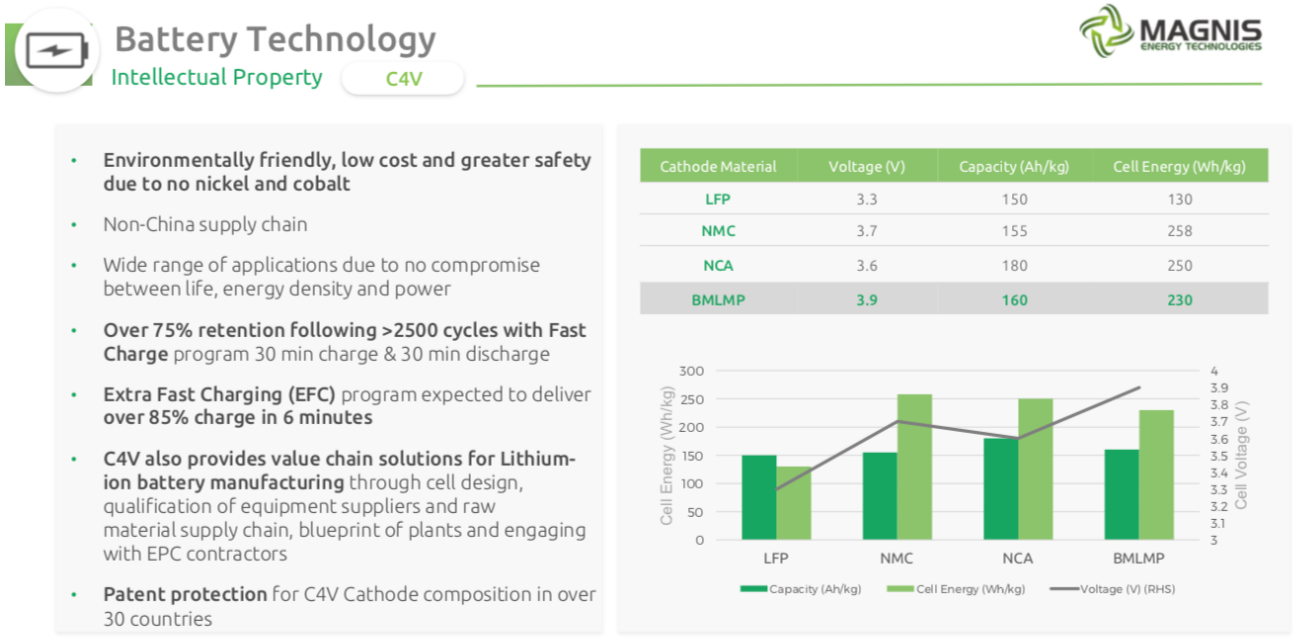
C4V also has a proprietary technology that enables spheroidising and coating of the graphitic anode without the need for purification, resulting in zero use of toxic chemicals such as HF and HCL. MNS has exclusive rights to this green technology.

The phosphate rich cathode chemistry is both nickel and cobalt free. This is important as nickel may make up only ~4% of the total weight of an EV, but it has the second-highest carbon intensity and cobalt is the most expensive element in any NMC or NCA cell.

The energy density of the BM–LMP cell sits between a NMC and a LFP cell. With an energy density of 230Wh/kg, C4V suggests its cell sits about 75% higher than LFP and 10-12 % below NMC cathode chemistry.

Safer than NMC/NCA – Key factors that make this one of the safest battery cells on the market includes;

- **The BM-LMP cell chemistry is nickel and cobalt free…and**
- **… is fire resistant. Cell chemistry is oxide free thus no free oxygen is present; and**
- **A cooler future proof prismatic cell format will be used**



The safety of a LIB cell is determined by its composition, size and energy density and the greater the energy density and/or voltage; the greater the chance of a short circuit. When this occurs in the presence of an oxide (oxygen rich), then uncontrolled heating known as thermal runaway can occur within the battery pack causing explosive battery fires.

C4V's BM-LMP chemistry mitigates thermal runaway by using a nickel, cobalt & oxide free chemistry. **iM3NY** has further reduced thermal runaway risk by switching to an advanced prismatic cell format with internal partitioning, which is considered safer than either the cylindrical or pouch cell formats. The **iM3NY** cell format, when compared to its competitors, will have a newly engineered seal and improved volumetric efficiency. With safety concerns rising in line with a rising trend for high nickel batteries, VW also plans to switch from pouch to a prismatic cell format at its US EV plant in Tennessee from 2023. To meet VW's demand, battery cell makers SK Innovations and LG Solutions will also need to switch from pouch to prismatic cell format. Tesla continues to use both the cylindrical and pouch cell formats, however, it is hoping to mitigate thermal risk with its own unique battery pack cooling system.

Key aspects of C4V's cell chemistry include;

- **Highest voltage on the market –** The higher a cells voltage the greater the electric potential between the positive and negative electrode, resulting in fewer cells to meet required energy levels for a battery pack. **Consequently, the higher the voltage the smaller and lighter the battery pack. This high power to weight is a key performance differentiator.**

  The BM-LMP cell has a voltage of 3.9V, which is ~20% higher than LFP at 3.2V and some ~5% higher than NCM/NCA cathode chemistries at 3.7V

- **Cycle life** Many factors contribute to cycle life but generally the higher the voltage the higher the energy density and the longer the cell life. BM–LMP has reported a cycle life of ~5,500 cycles and growing and is expected to last up to 20-years in stationary storage. The use of a prismatic cell format also helps to retain cell cycle life.

- **Driving costs down –** Almost 50% of the cost of the car is the battery. C4V suggests the lack of expensive nickel and cobalt results in a ~30% decrease in battery cell costs

- **Easier to recycle – iM3NY** cells have low scrap rates. Currently working with 3 recycling companies; and

- **Supports super fast charge –** In June 2021, MNS reported that 75% cycling retention had been recorded after 2,513 cycles. This cell has now delivered 5,500+ cycles with around 64% capacity retention. High voltage and low current loss, suggests energy density loss is also minimal despite the absence of nickel and cobalt in the BM–LMP cell. NMC cells dissipate current quite fast, which reduces voltage and hinders fast charge capability. C4V suggests its Generation-2 Bio Mineralised technology will be used alongside a nickel-rich cell chemistry in N-series cells to improve NMC outcomes. Results below show cycling at 2C rates with 30minute charge and 30 minute discharge. In June '21 MNS reported that **C4V had managed to record 85% charge in 6 minutes after 100 cycles.** Greater cycle testing is being done to confirm results.

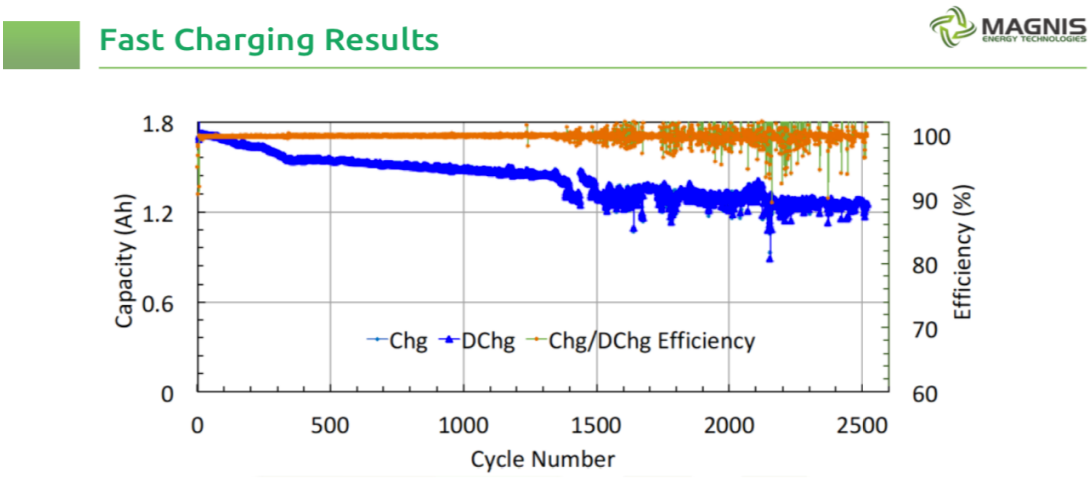


Figure 4. Optimised fast charging BMLMP cell cycling data at 2C-2C rates with 30 minute charge and discharge of the cell

ASX:MNS

C4Vs – Solid-state battery cell

- **Working prototype presented at NYBEST Conference in New York in 2018**
- **Solid-state has been undergoing qualification for some years**
- **Targeting 400Wh/kg or 800Wh/L**

iM3NY believe they have a good solid-state IP, with patent protection provided by **C4V** for it's semi-solid electrolyte.

Generation-2 N-series anodes will also use silicon-coated graphite on a copper foil. However, with the arrival of the Generation-3 cells, **iM3NY** suggests the electrolyte could ultimately be solid and the anode lithium metal. The link between the two generations of anode could be the semi solid-state battery (SSSB), which **iM3NY** suggests could be in commercial production from 2027.

In 2018, **C4V** presented a 380Wh/kg prismatic cell format prototype of its SSSB at the NYBEST Conference in New York, where C4V reported that the working prototype lit up a LED light. C4V suggested at the time that more than 80% of the liquid electrolyte within the cell was replaced with a solid electrolyte to produce a semi-solid-state technology. C4V is aiming to increase the energy density to approximately >400Wh/kg or >800Wh/L. C4V claims its prototype SSSB is able to extend the range of an EV from an average of 300 miles to 510 miles (820 kilometres) on a single charge.

Other competitors in the solid-state space include Solid Power, Quantumscape, Samsung SDI, Toyota and LG Solutions.

India is also looking to build an ex China supply chain. C4V reports that it has been sending cells from its New York pilot line to India for qualification for some years now and it has been reported that they have an MOU with the Karnataka state government in India. C4V plans include ~5GWh of capacity by 2025 increasing to 100GWh by 2030 and 300GWh by 2035. **From where we are standing today, this does look like a big ask? Big partners with deep pockets would be expected to assist with any significant rollout and expansion.**

The company is looking to target applications ranging from EVs and energy storage to defence applications such as drones and tanks. In line with its roadmap, it plans to make the technology ready with a liquid electrolyte before moving to semi-solid electrolyte and then onto fully solid-state by 2028.

C4V is planning to make Co-Ni free batteries available to Omega Seiki from **iM3NY** and potential future plant in India, including solid-state cell commercial tests in EV application. Shailesh Upreti, Chairman and founder, **C4V** said "*C4V is going to be the lead company introducing thermally stable solid-state batteries for the first time in the Indian market. Extensive R&D and 10 years of development work are going to help us pioneer cell manufacturing in the Indian market. Our batteries are custom-designed to meet emerging market needs and our manufacturing platform is highly compatible to countries, which are yet to develop a cell manufacturing supply chain. We are looking at a modest speed scale up to target of 5GW in 3 years from now*."

Although the working prototype was evident in 2017, there has not been much said about their solid state battery in recent years, other than what has been reported in India. However, Dr Upreti remains confident and it is clear that the focus has been on **iM3NY**. We note that competition for solid-state in India is rising; with 24M Technologies recently announcing it is moving quickly to produce semi solid state in India from late 2023.

IM3 – battery cell Gigafactory (MNS ~60%*) and C4V (~37.6%) *(* Includes direct & indirect interest)*

- **Will source battery cell components using a Partnership model**
- **iM3NY to use autonomous machinery, Big Data and advanced AI; and**
- **Supply chain qualification achieved with 60 partners, including the DOE**
- **Drop-in manufacturing process will speed up acceptance of new chemistries**

iM3NY is an unlisted company with stakeholders C4V (38%) and MNS (~60%*). iM3NY battery cell Gigafactory is located at Huron Campus (Technology Park) in Endicott Upper New York State.

iM3NY has reported it has an exclusive US manufacturing license agreement with C4V. **iM3NY**'s vision is to produce the greenest and safest batteries in the world and global Lifecycle consultant Abt Associates; ASX release – iM3NY batteries to be one of the greenest batteries ; believe their batteries meet the brief. **iM3NY** intends to manufacture the battery cell, whilst its customers will manage the manufacture and assembly of the battery pack for sale to auto OEM's.

Dr Upreti, who is founder and President/CEO of C4V, is also Chairman of **iM3NY**. Chaitanya Sharma is the CEO of **iM3NY** and an ex senior Tesla engineer at Tesla's Nevada auto Gigafactory. **iM3NY** has an exclusive US manufacturing license agreement with C4V that enables it to use C4V cell chemistry technology in all of its batteries. We understand the technology licence agreement is in perpetuity as long as licensing terms are maintained and to monetise this technology, **iM3NY** is currently constructing a battery cell plant in Endicott, which is currently scaling to 1GWh. Fully automated production is expected in 1H 2022 and C4V's vision for **iM3NY** is expand to 32GWh by 2030. As discussed later in this document, we cautiously risk this outlook.

The technology hub at Huron campus presently has 2.5m square feet (or ~60acres) of un-tenanted capacity available. To date **iM3NY** has leased 250,000sq feet or ~6acres or just 10% of warehousing at Huron Campus, a technology hub, at Binghamton University, Endicott, New York State. **iM3NY's current lease** could support ~5GWh/year of cell production. The campus or tech park spans 150 acres and ~60acres, currently unused. This suggests that significant capacity addition could be accommodated on site. Thus, to achieve the end goal of 32GWh, another large site could be required. Presently, there appears to be substantial available sites near the Huron Campus in Endicott, however if a battery cell ecosystem develops around **iM3NY**, we consider that site availability could become a premium.

IBM previously manufactured high tech equipment on this site and consequently temperature and humidity controlled buildings remain. There is also a pre-existing 50Mw transmission line and a 100Mw power station from the IBM days which can deliver steam, chilled water and compressed air to the site, which is also situated close to renewable sources and e-mobility markets (NE USA). The existing facilities that remain on site and its availability to the cheapest (@<US$0.5/kWh) and greenest power, from Niagara Falls, supports the value proposition offered by this site.

Despite existing dated IBM infrastructure, C4V realised early on that new tech and innovation was required inside the plant, as old tech is unable to scale efficiently. To this end, **iM3NY** will use an advanced autonomous factory system alongside machine learning to produce the greenest and safest batteries on the market. Artificial Intelligence (AI) will be used to monitor the plant and will be able to assess and monitor each supply chain partner's product quality and supply chain metrics in real time (refer page 18; for more information on **smart manufacturing and Industry 4.0).**

iM3NY is working through a design **FEED with Danish based global Engineering Firm, Ramboll**. The company is a global leader in creating sustainable engineering solutions.

To expand technology deployment beyond the US market, C4V will offer a manufacturing **Partnership Program**, where they will offer up their fully qualified upstream and downstream supply chains and EPC contractors for an equity plus license fee/royalty/kWh of production. C4V envisages co-location of its supply chain partners around new battery cell Gigafactories will provide cost savings through a collaborative EV ecosystem and accelerate a build out globally.

Meeting EV demand sounds easy right…**but here's the rub!** A 1GWh factory can only supply enough batteries for around 15,000 EVs per year. In 2021, there were 290.5m registered vehicles in the US of which only ~1.8m were EVs!

Bottom line, there is a mighty lot of battery cell and auto Gigafactories required between now and 2030!

Other highlights of the plant include;

- **Takes years to qualify** – The project has been in motion for 10 years and fund raising began in 2017
- **Qualification track record building** – **iM3NY** battery has been qualified by 60 potential partners
- **Modular in design** – at ~5GWh each and scalable
- **Contracts** – Sales with 8 customers and reported to be in discussions with some bigger US companies
- **Drop-in manufacturing process developed by C4V** – there is no need to learn new processes and design as **iM3NY** advances from the Phosphate (P) - series cells to the Nickel (N) - series cell chemistry; C4V believes this could eliminate costly disruptions along the manufacturing line and minimize learn curve hurdles while **iM3NY** scale from 1GWh to 32GWh However, a partial upgrade might be necessary to move to the solid-state series; and
- **Build-out plan** – Planning 1GWh of capacity in 2022 to 30GWh by 2028 for 32GWh by 2030. Recognising manufacturing and funding risks, we risk this outlook considerably; and

In 2018, **C4V** bought a battery cell plant for US$5m from an insolvent Alevo USA Inc a North Carolina LIB start-up and had it shipped to New York in February '21. The MNS 2020 annual report stated that O'Brien & Gere, a 100%, valued the equipment owned subsidiary of Dutch engineering giant Ramboll at US$71.3m. Additional machinery was then acquired from lithium cell manufacturer A123 Systems and included, slurry making, stamping and stacking machines, solvent recovery and refining. The arrival of this equipment at **iM3NY** increased capacity by 0.6GWh to 1.8GWh for 2022.

Im3NY Battery Cell Equipment ***(Source: Magnis)***

Figure 2: Battery Cell Formation Equipment

Product Roadmap – smart manufacturing and innovative growth

- **Phosphate rich – P-series BM–LMP is already commercialised at 190+Wh/kg**
- **Nickel rich – N-series BM-NMC-Si, ESS & high end EV, >280Wh/kg, late '24**
- **Solid-state still in the roadmap but rarely talked about**

There is a current roadmap to growth that suggests that there will be three to four generations of batteries that can be 'dropped in' to the C4V battery cell technology over the coming decade.

- **First generation nickel & cobalt free phosphate rich P-Series battery cells –** will use C4V's BM–LMP cathode cell chemistry to begin commercial production 1H22. These nickel and cobalt free cathode cells are already commercially available with an energy density of 190+Wh/kg and run at 3.9V and 50+Ah. Generation-1 batteries may also include a patented anode coating process, which achieves yields of ~75% compared to industry norms of ~40%. With this technology, **iM3NY** expects to increase cycle life to 3,000+ and reduce battery cell costs to become highly competitive against Asian suppliers. Pre-production cells should be available for customer testing by end 2021, with production quantities available by mid 2022 along with faster charge cells by mid-2023.
- **Second Generation high nickel N-Series battery cell –** will use a Bio-Mineralized high NMC oxide rich cathode with a silicon blended graphitic anode chemistry. C4V is targeting an energy density of 280Wh/kg or 550Wh/L at 70Ah. The nickel rich cathode with a reduced cobalt design will partner with a graphitic active anode material, which will be optimized with a silicon coating to achieve an energy density of 280-300Wh/kg. C4V also plans to introduce a thermally stable electrolyte to further enhance cell performance and stabilise the nickel rich cathode material. With this technology, **iM3NY** expects to reduce battery cell costs to ~US$100/kWh at multi-GWh production capacity. C4V expects to have cell Sample A available by mid 2022 and cell Sample B by mid 2023
- **Third Generation solid-state battery cell for EVs and ESS –** the arrival of a commercially available SSB is planned for late 2026 and could drive **iM3NY** output to 32GWh by 2030-2032. We currently amp at a slower pace. C4V suggests (refer below), that energy density could rise to ~400Wh/kg and ~900Wh/L at 100+ Ah. C4V suggests that this technology could increase cycle life to 10,000+ and reduce battery cell costs to under $100/Kwh cost; and
- **Fourth Generation battery cell for ESS & all transportation –** C4V hopes to deliver a lithium-ion sulphur cell, which should be very light with an energy density target of ~500Wh/kg and ~1,000Wh/L at 125+ Ah. No date is presently available for the delivery of these cells, nor is there much known about how this might be achieved.

The higher energy density SSB's, would be expected to present an opportunity for the aviation industry. The N-Series with a range of ~300 miles is what industry has really focussed on over the last 5-7 years. However, shortages in class-1 nickel and cobalt and the resultant price squeeze, has resulted in an increased interest in LFP cell chemistry with its 200-240 mile of range. Tesla, as well as using NCA & NCM, has also been using LFP cathode chemistry at its Shanghai auto Gigafactory and will now use LFP in its Model 3. This looks is good news for C4V as its BM–LMP cell chemistry has a +20% energy density and higher driving range over LFP…and the US love their bigger longer mileage vehicles.

A Product Roadmap that Advances Technology Significantly *(Source: C4V Town Hall Presentation May 2021)*

	Gen 1	Gen 2	Gen 3
Cell Chemistry	BM - LMP	BM - NMC + Silicon	Solid State
Form Factor	Prismatic	Prismatic	Prismatic
Capacity (standard)	**50 Ah**	**70 Ah**	**112 Ah**
	+ 20% vs Competition	**40%**	**60%**
Energy density gravimetric	**190 Wh / Kg**	**280 Wh / Kg**	**400 Wh / Kg**
	+ 20% vs Competition	**48%**	**43%**
Energy density Volumetric	**400 Wh / L**	**550 Wh / L**	**810 Wh / L**
	+ 20% vs Competition	**38%**	**47%**
Life Cycles	**3,000+**	**2,000**	**10,000**
Key IP - Patents	Co and Ni free Cathode Bio Mineralization	High Ni Cathode and Si Anode Bio Mineralization	Solid Electrolyte Demo in 2017
Production Availability			
Samples	Q'4 2021	Q'2 2022	Q'4 2023
Production Quantities	Q'3 2022	Q'3 2024	Q'3 2026

Total Contracts – Quantity Building Nicely

- **Over US$729m of short to medium-term binding sales contracts**
- **Part of the US Government supply chain**

Although **iM3NY** has binding sales contracts of almost US$729m (A$1Bn), there is only visibility around 65.4% of the offtakers. MNS suggests there are other contract negotiations in the mix. What we do know is that;

- **US Government Supplier** – In August '21 MNS announced that **iM3NY** had secured a US$74m 4-year contract with a US Government supplier ASX release - Contract with US Govt supplier.
- **Sukh Energy** – **iM3NY** has signed a US$243m contract with a 5-year term with Indian based energy and telco company Sukh Energy. ASX release - Sukh Energy Contract

Omega Seiki a subsidiary of Anglian Omega –C4V recently signed a US$160m contract with Anglian Omega, Omega Seiki with a 5-year term. Omega Seiki manufactures electric three-wheelers for the growing Indian market. ASX release - Omega Seiki contract. After 5 years, C4V hopes to fill the contract from its Indian Gigafactory. We do not value this long dated Indian option at this stage. MNS holds 9.65% of C4V.

MARTAC – Supplier to the US Navy after a 3-year qualification with MARTAC. There has been reference to a small 5-year contract between MARTAC and C4V; refer 2019 reference to small 5 yr contract C4V has been providing prismatic format cells with its patented Firesafe^{TM} BM–LMP technology to Maritime Tactical Systems, Inc (MARTAC) a supplier of autonomous water and surface electric boats to the US Navy, for nearly 2-years. Refer; ASX release - Martac; C4V ready to set foot on the sea. In May 2019, C4V announced it had supplied its first battery pack to MARTAC and in January 2020 further announced MARTAC had received 5 battery packs for testing.

Included in the announcement above MARTAC CEO, Bruce Hanson was reported to say, *"MARTAC has conducted extensive testing comparing the C4VTM technology with currently available battery technologies. In all major categories, the C4VTM technology outperformed the others. We are excited to get full certification of the C4V battery packs to deliver this superior technology to our customers – both domestic and international."*

The MNS 2020 annual report states *"The batteries provided to MARTAC were in the same form as batteries that are planned to be produced from the iM3NY Y Gigafactory in New York. MARTAC conducted critical test protocols to qualify C4V cells…"* This suggests heavily that a US Government supplier has qualified the C4V BM–LMP battery cell technology.

Other commercial scale demonstration and test programs of BM–LMP cells include;

- **US Department of Energy (DOE)** focused on solar powered hybrid system for enabling grid stabilization in New York State ASX release - C4V selected to supply LIB to US Department of Energy Funded Project
- **DOE Project** building in a hybrid https://drive.google.com/file/d/19QK6xLypo9cumZJbvBZtN2QX0MsEglP8/view grid storage on Long Island. NYSERDA working with Loxus power company; and
- **New York State buses –** Demonstrating fast charge capability for buses, working with Edison & BAE Systems and funded by NYSERDA. Significant upside given Biden's pledge to electrify ~50,000 buses or ~70% of the US fleet by 2030. British company BAE Systems is the largest defence contractor in Europe and reported to be one of top 6 suppliers to the US Government. ASX release – BAE Systems and Consolidated Edison join C4V on extra fast charging technology as NYSERDA provides grant

Contracts	Date Announced	US$m Amount	Contract term	Owner of Contract	Buyer Location	Commentary Demonstration opportunities
Martac	mid '19	N/A	5-years	iM3NY	USA	Supplier to US Navy, small volume?
Sukh Energy	May '21	243	5-years	iM3NY	India	
Supplier to US Govt	Aug '21	74	4-years	iM3NY	USA	Not Martac as announced in 2020
Omega Seiki	Sept '21	160+	5-years	C4V	India	Start '22, Electric 3-wheelers in India
Market knowledge		**317**				
Announced Contract Quantity		729				
Unaccounted volumes		**412**				

Source: Magnis Energy Technologies, iM3NY and C4V

American made supply chain

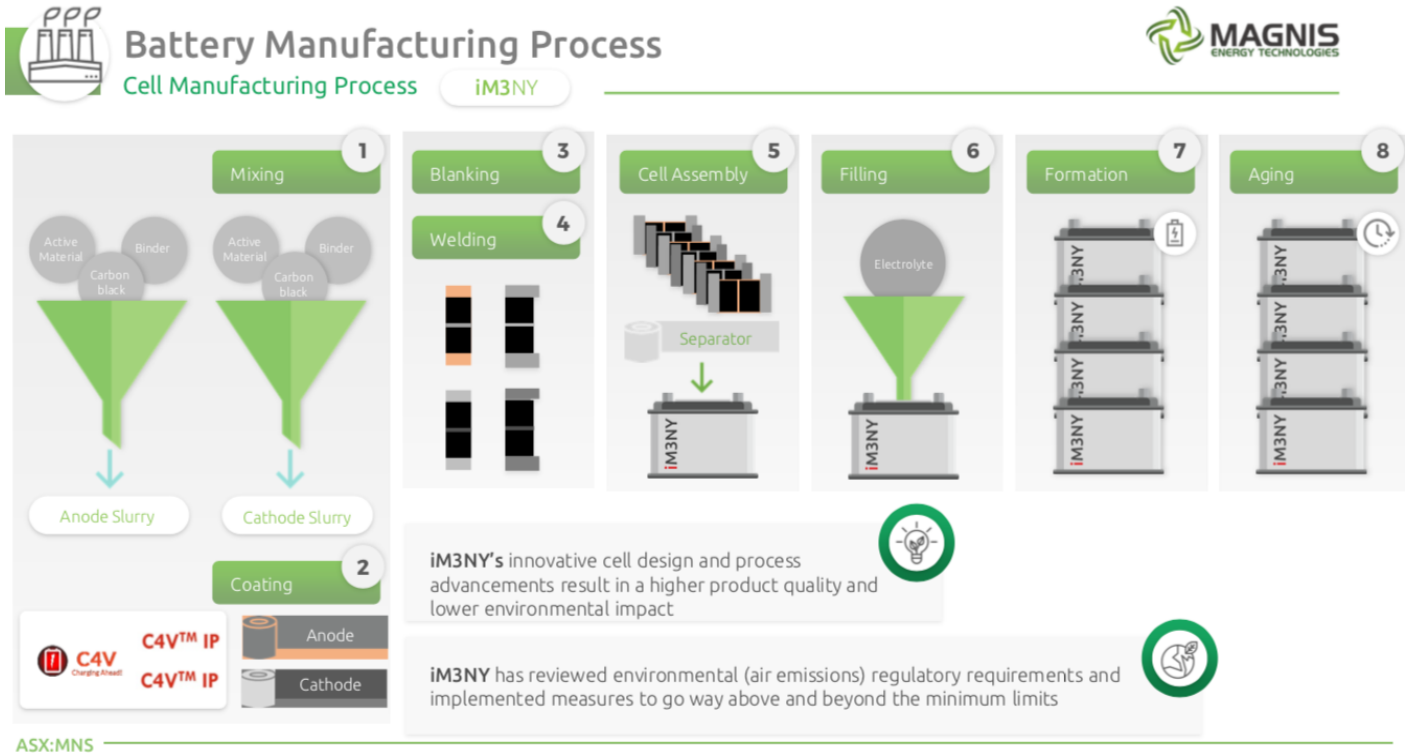
iM3NY has some 60 partners globally that have been qualified and are working with C4V in commercialization journey. This has not happened over night in fact it has taken 6-years to arrive at this point and cell qualification alone can take up to 18-24 months to qualify one such partner. Despite significant global cell qualification, approximately 80% of **iM3NY** cell have domestic content, with no China componentry present within its supply chain. C4V suggests that remaining specialty products not available in the USA will come from Europe and Japan. The aim since C4V's conception has always been to maximise local content by securing ethically sourced local supply chains and recent policy support by the Biden Administration supports C4V's timing.

Logistically, shorter supply chains make sense as they reduce costs and increase efficiencies. To this end, **iM3NY**'s anode and cathode manufacturers are located in the US, rather than in China. Local supply chain partners also enable the efficient use of collaborative and predictive software to achieve an inventory light model, which is expected to reduce the need for large bulk storage of precursor materials on site. Blockchain is emerging as a key technology to enable transparency in supply chains.

Due to ultra low toxicity, 99.9% of the BM–LMP components can be recycled fairly easily. C4V has indicated publicly that they are presently talking to 3 recycling companies with a view for 10-15 years before recycling is required on mass. Any redundant cells in the manufacturing process are recycled easily on site. As mentioned earlier, C4V will be using its advanced AI and Big Data to ensure they work with the greenest recyclers.

Manufacturing flowsheet

- Mixing of raw materials into a slurry which is then;
- Coated onto the respective anode and cathode; then
- Blanking & welding of the electrodes – slit machine and tab put into cell; then
- Cell assembly – The separator is added to the anode and cathode and placed inside the cell; then
- Electrolyte is then poured into the cell; and then
- The cells are then put into 'Formation' on the factory floor. This resting stage is vital to achieving an effective Solid Electrolyte Interphase (SEI) on the anode. Failure will result in early degradation of the cell. Formation is also where the initial charge and discharge of the battery takes place over some <5hours; then Cell aging follows.



Automation, Artificial Intelligence, Big Data & Machine Learning– the future has arrived!

- **Building efficiency, resiliency and sustainability**
- **Collaborative smart manufacturing**
- **Quick response time to customer concerns; and**
- **AI supports automation and predictability reducing downtime & costs**

iM3NY plans to use an automated ecosystem approach through industry clusters, which will enable digitising all links in the chain. **iM3NY's** timeline suggests it should start semi automated operations by end 2021 before becoming fully automated in 1H22. As production ramps slowly, and automation increases, greater system efficiencies should be achieved. However, as **Elon Musk said earlier in the year "manufacturing is difficult" and the start and commissioning of any manufacturing plant always presents stakeholders with short-term execution risk.** This is in part mitigated by CEO Chaitanya Sharma, who was a senior member of the team that worked inside Tesla's first Gigafactory and reported testing of equipment purchased by MNS in June 2021.

Increasingly, this is being referred to as the Fourth Industrial Revolution and like the three before it is expected to have profound effect on humanity. Its role in accelerating the arrival of the EV cannot be underestimated. Manufacturing will become more connected and processes will become slimmer and faster and real time audits will enable every link in the supply chain and factory eco-system to be scrutinised. Transparency of these and partner audit results will enhance marketing outcomes between customers, partners and **iM3NY**.

Embedded sensors on the factory floor will stream an abundance of big data to centralised computers, which with the use of analytics and augmented reality will supports a real time view of the manufacturing facility. This use of augmented reality, combined with remote management tools and predictive cloud based software, is designed to monitor, manage and minimize or avoid entirely, costly equipment downtime.

AI and machine learning (ML) facilitate intelligent manufacturing outcomes by analysing every step in the engineering and manufacturing process to drive system improvements in efficiency and sustainability. In summary, digitisation is supporting **iM3NY**'s vision to produce unique "closed loop" batteries, which have been recognised by global lifecycle consultant Abt Associates as the greenest, least wasteful, safest and lowest cost on the market.

Digital technology is also expected to facilitate customer and partner collaboration. **iM3NY** has suggested that 'Big data' will rigorously test 3rd party supply chains to ensure sustainable and eco-efficient choices are made.

Benefits of an efficient factory ecosystem;

- Provides real time data
- 3D Printing
- Ease of traceability supports eco-efficient supply chains
- Increased factory reliability and fastened time to market
- Tracks machine parameters remotely
- Increase productivity, automate procurement and logistics
- Improves financial outcomes; and
- IBM suggests that effective AI can deliver up to 30% increase in output, a 15% reduction in waste generation, and a 5-10% reduction in opex
-

Figure 1: Timeline of various production stages

ESG – world's safest, greenest & cheapest cells

- **Aim to meeting stringent ESG guidelines**
- **Green batteries – certified 80% greener than competitors**
- **Certified as the safest batteries; and**
- **Low scrap rates and easier to recycle**

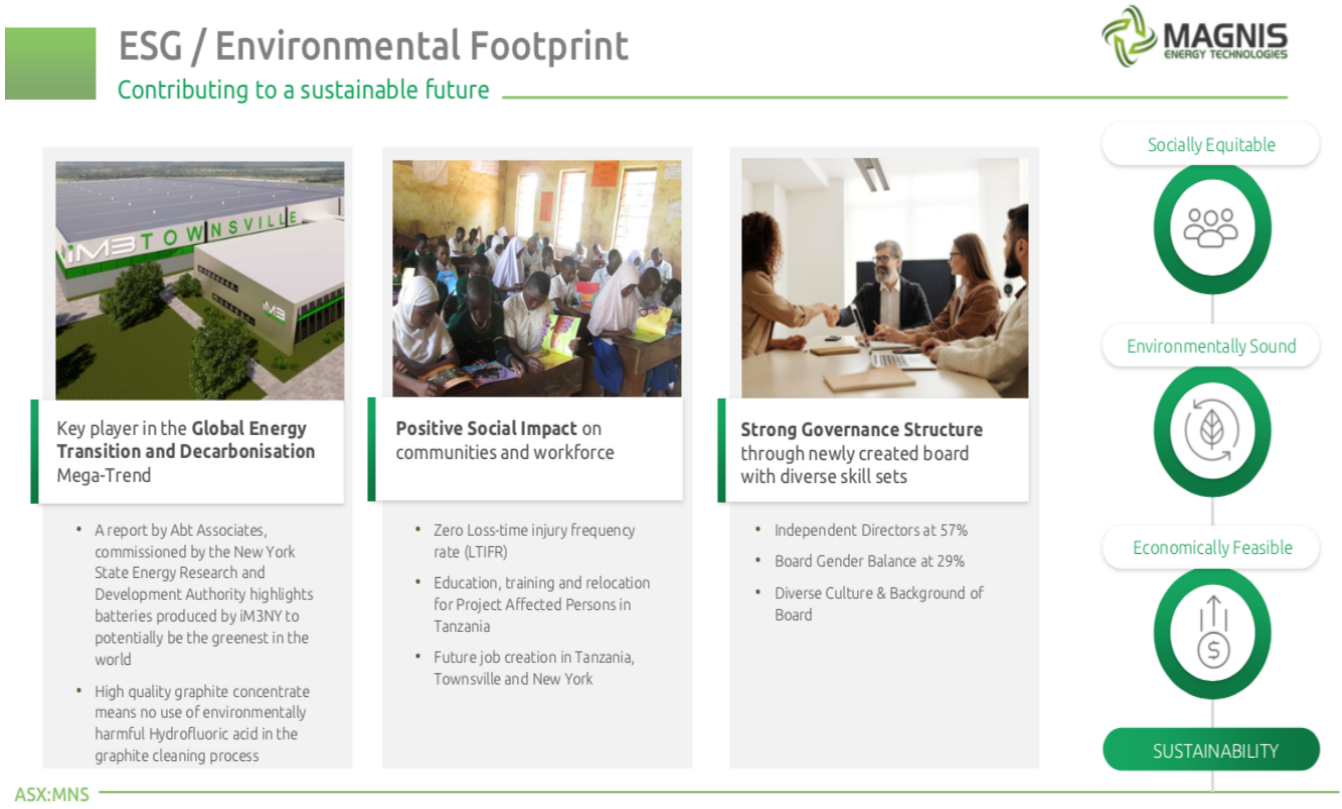
Transparency into the origin of battery raw materials is increasingly important as automotive OEMs use strategic procurement to lower carbon emissions across their supply chains. To achieve this, **iM3NY** will use intelligent digital systems enabling it to evaluate potential partner and vendor supply chain thereby; ensuring it maintains its premium green rating.

With sustainable supply chains a focus of automotive OEM's and more recently the financial markets, there is much at stake. NYSERDA commissioned a 3rd party valuation by Abt Associated, which certified the **iM3NY** batteries as the greenest in the industry, suggesting its lifecycle carbon footprint is ~85% less than its competitors. A key differentiator, given **iM3NY** cells provide twice the life cycle of traditional LIBs.

To overcome concerns around the use of toxic NMP and di-methyl ketone or acetone, **iM3NY** is looking to devise a process that specifically reduces the use of NMP and eventually completely remove it from the process. From an ESG perspective this will be a key differentiator providing a key marketing advantage.

Other ESG benefits of **iM3NY** cells;

- Generate least amount of scrap from batteries
- Easily recycled
- Air emissions, aquifer 99% removal of stuff in air (clean & green gold standard)
- Circular economy – recycle partners, 99.99% components will be recycled, qualified 3 recycle companies when batteries ready (10-15yrs) to feed back into value chain; and
- ~50% power is hydro power generated by Niagara Falls
- Spheroidising & coating of graphitic carbon to make anode material without the use of HF and HCL is a world first



Grid Storage

- **Long life BM–LMP cell chemistry also targeting grid stabilization**
- **Selected by US Government to formulate a multi solar system organiser**
- **Provide fast charge batteries for domestic microgrids**

C4V's channel to market for its phosphate rich cells was originally targeted at grid scale storage where 4-8hrs of storage is the norm.

In early 2021, C4V announced it had been selected by the United States Government to work with the DOE, the New York Power Authority and National Renewable Energy Laboratory to focus on using batteries to build an integrated solar powered hybrid system for grid stabilisation. The project will be led by Binghamton University and be used to coordinate outputs between multiple solar plants, which are vulnerable to generation uncertainty.

At the time of the announcement **C4V**'s Dr Upreti stated…

"We are very excited to be selected in another US Government project and being the sole partner providing cutting edge li-ion battery technology immensely favourable to renewable energy adoption. We look forward to working with our partners to demonstrate the agility and robustness of our BM–LMP technology for the grid stabilization."

C4V plans to use well-developed predictive software called Digital DNA to manage system vulnerabilities. Variable throughput, the result of unpredictable weather conditions can result in insufficient supply and increase the risk of grid destabilization. The constant voltage of the BM–LMP cell plays into this dance card well.

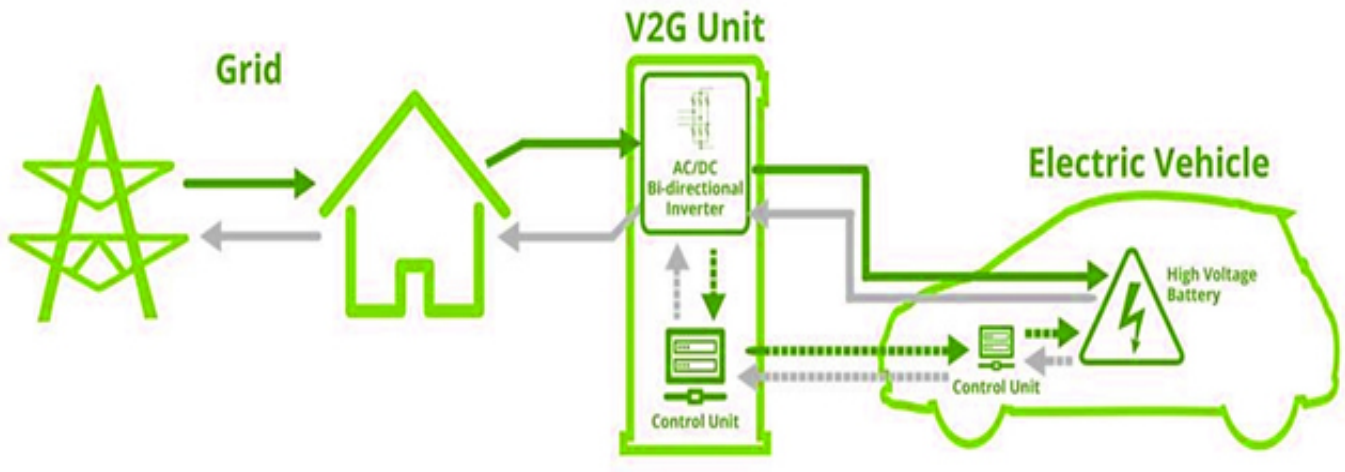
A 1MW hybrid solar plant is being used to test the ability to scale and replicate technology for use by the New York Power Authority. This is where the whole of **C4V/ iM3NY** comes together to use improved manufacturing processes and materials and new sensors and software to optimize the operation of the system, while minimizing maintenance and reducing system-operating costs.

C4V also believe they have technology to increase grid storage from around 4 hours to longer duration storage and are working on making further improvements. Batteries for microgrids require cycle life of many thousands of cycles. At this stage, only LIBs are capable of providing cycles capable of providing a long 2nd life.

When a battery's coulombic efficiency falls below 80%, the battery can start its 2nd life as part of a microgrid. However, waiting for this to happen in volume is expected to take time. Scaling of the BM–LMP cell could support bi-directional energy, which can be used during the night or, when required, during a power outage.

Between 2017 and 2020, the Tesla energy storage division deployed 6GWh to balance grids. Tesla is integrating a V2G technology into the electrical architecture of the Model 3 and VW's modular electric drive matrix (MEB) will be V2G capable from 2022.

V2G - Enables customers to earn revenue from car whilst it is not being driven



Source: EDF

Nachu – high purity flake graphite

- **Fully permitted with mining licenses & environmental approvals secured**
- **British Common Law System**
- **No chemical treatment of graphite concentrate**
- **Minimal flotation and no purification required**
- **Power sourced from mix of gas and hydro**
- **Process results in higher yields supports more energy efficient output**

Legislative changes to Tanzanian mining law in July 2017, cast doubt over future development, impacting the share price of many juniors in Tanzania. The new Tanzanian President Samia Suluhu Hassan recognises the need for foreign capital to further develop Tanzania and already, other new projects in Tanzania have broken dirt.

With Nachu, MNS is positioning itself as a vertically integrated manufacturer of high-value graphite materials products, as opposed to a graphite mining company. In fact many graphite opportunities around the world are doing the same to ensure their projects can get to market after numerous failed attempts in the recent past. “With lowest quartile cost and significantly reduced environmental footprint, MNS expects its anode graphite to be a compelling choice for sustainable industries using lithium-ion batteries.” CSPG, SPG and expandable graphite and other graphitic products are undergoing rising demand due to systemic growth in EVs and clean energy delivery.

The Nachu project has been on the eve of development twice before. The project was discovered in 2013, a pre-feasibility study was completed in 2014 and a banking feasibility was completed in 2016. An Environmental certificate was issued in August 2015, and a special mining licence (SML) 550/2015 was granted in September 2015. In mid 2020, samples of Nachu coated SPG were sent to Japanese and South Korean anode suppliers.

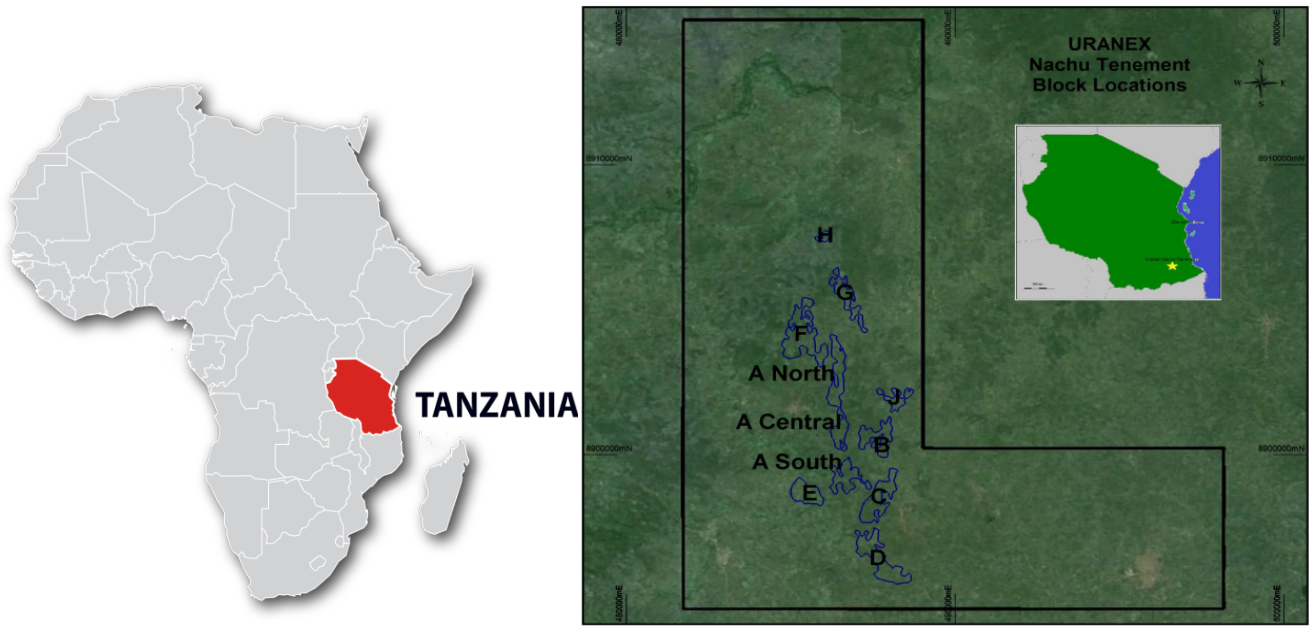
With EV demand rising and graphite taking up to 20-25% of the battery by mass, it seems like now is the time to really push the development, especially in the context of supplying graphite to the **iM3NY** battery cell Gigafactory in New York.

Location

The Nachu Graphite Project (MNS 100%) Prospecting Licence (PL) covers an area of approximately 199km² and is located near Ruangwa, in southeast Tanzania. Mtwara city in Tanzania is the closest regional centre to the project and has port facilities and an international airport. The port was recently expanded from 400,000t/year to 750,000t/year, taking the available active berths available from 2 to 4.

The SML that was granted covers 30km2 within the Nachu PL.

Location Map – SE Coastal Tanzania AFRICA *(Source: Magnis Energy Technologies)*



Geological Setting

The graphite mineralisation at Nachu occurs within the mafic and felsic meta sediments such as gneisses and schists of the mobile Mozambique metamorphic belt. Although the rocks have undergone thermal alteration due to prolonged tectonic activity, they are not hard and the deposits are often located close to surface. At Nachu this is the case, with a strip ratio of 1.42:1. Importantly, this broad based thermal alteration over time has graphitised the in-situ carbon forming ultra high quality graphite.

Resource

A total of164 reverse circulation holes and 40 diamond (DD) holes for -21,007 m have been drilled and analysed for graphite content over Nachu, which contains 5 separate deposits. A significant number of high-conductance targets/anomalies remain on the Company's tenements

Nachu has a mineral resource of 174mt across 5 deposits grading at average 5.4%TGC to yield 9.4mt of contained graphite (Cg). However, as Block F contains 71% of the measured, indicated and inferred resource; it is the focus of initial development at Nachu. Within this the primary ore comprises.

Block		B		D		F		FS		J		Total	
		Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade	Tonnage	Grade
		Mt	%Cg	Mt	%Cg	Mt	%Cg	Mt	%Cg	Mt	%Cg	Mt	%Cg
Measured	Oxide					1.7	4.9	0.2	5.2			1.9	4.9
	Primary					57.8	4.6	3.8	5.6			61.6	4.7
Indicated	Oxide	0.2	6.5			1.3	5.4	0.2	5.4	0.7	8.3	2.4	6.3
	Primary	6.6	6.3			38	5.1	5	5.1	9	8.1	58.6	5.7
Measured & Indicated	Oxide	0.1	5	0.7	5.9	1.7	5	0.01	3.2	0.04	10.1	2.6	5.3
	Primary	0.8	5	19.5	5.9	22.5	5.2	1	3.5	3.2	10.2	47	5.8
Sub Total		7.6	6.1	20.2	5.9	123.1	4.9	10.2	5.1	12.9	8.6	174	5.4

Block F contains a measured, indicated and inferred resource of 123mt grading at 4.9% to yield 6mt Cg. Some 46% of the measured indicated and inferred resource is classified in the measured category. The oxide ore will find its way to the tailings for processing years 12-16. The reason is that oxide ore does not respond as well to flotation as unweathered primary ore.

JORC Resource Category	Tonnage (mt)	Grade (%Cg)^3	Cg (kt)	% M&I&I
Measured	59.5	4.6	2.7	46%
Indicated	39.3	5.1	2.0	33%
Inferred	24.2	5.2	1.3	21%
Measured & Indicated	98.8	4.8	4.7	
Measured, Indicated & Inferred	123	4.9	6.0	

The 123mt resource is inclusive of ore reserves, which are detailed below. Further exploration of the resource could prove up additional resource, which could push out further the mining of the lower grade tailings stockpile.

When calculating the proven and probable (2P) ore reserve a nominal 3% TGC cut off is applied. The 2P reserve stated in the BFS is 76mt grading at 4.8% to yield 3.6mt Cg. An impressive 62% of the 2P reserve is delineated in the proven (1P) category, which carries a 90% probability of being present. This is particularly high and the product of extensive borehole work and a consistent flat lying resource.

Reserve Category	Tonnage (Mt)	Grade (%Cg)^3	Cg (Mt)	% 2P
Proven	50.5	4.6	2.3	64%
Probable	25.7	5.1	1.3	36%
Proven & Probable (2P)	76.3	4.8	3.6	100%

Tenure

A **Special Mining Licence** (SML) SML 550/2015 was sought and granted to Uranex Tanzania Limited (UTZ), a 100% owned Tanzanian subsidiary of MNS on September 2015. The SML, which covers an area of 30km2, has a 25-year tenure compared to a generic mining lease, which carries a lesser 10-year term. The SML covers all of the area that is included in the mining and processing operation. The SML operates under the jurisdiction of the Ministry of Industry & Trade.

Highlight of the UTZ operated SML includes;

- Regular mining open pit operations with ore zones starting at surface
- UTZ will deliver ore to the processing plant
- Capex of US$40m
- UTZ will pay tax at 30% and a 3% production royalty
- The Tanzanian Government receives a 16% profit share and free carry
- Provisions that prevent any form of nationalisation of the Project
- Fiscal stability which ensures all taxation, royalties and duties are fixed for the term of the SML; and
- In the model transfer pricing applies. Sales revenue is received by MTT inside the confines of the SEZ and a payment is made back to the UTZ, where MNS has a 84% interest. This is common treatment for SEZ payments.

The Nachu processing plant for Nachu would be located within a legislated Special Economic Zones ("SEZ's"), which lies within the SML. The SEZ legislation in Tanzania was established to attract foreign investment and balance trade. A SEZ offers significant tax, power and other upfront economic incentives and concessions to assist with value added developments and are used extensively in developing nations to attract foreign investment. In 2017, Magnis Technologies Tanzania (MTT) a wholly owned subsidiary of MNS, was granted a SEZ, which enables it to cost effectively process raw graphite into high grade graphite concentrates on site and gain access to the port in a timely manner. MNS states in its annual report that the SEZ operates under the jurisdiction of the Department of Industry, Trade and Investment

Highlights of the Special Export Zone (SEZ) include;

- MNS has a 100% interest in the Nachu SEZ, which covers 206 hectares and is not included in the Nachu SML
- Exemption from corporate tax for 10-years. This was recently renewed in May 2021
- Falls under the jurisdiction of the Department of Industry, Trade and Investment,
- Capex of US$230m and LOM sustaining capital of US$70m
- International arbitration available if dispute resolution required
- Revenues from product sales will be paid into foreign accounts mitigating sovereign risk

Mining & Production

The 2016 banking feasibility study (BFS) envisaged a 15-year mine life, which included mining ore for 12 years at 240kt/year before treating lower grade ore dumps at a rate of 160kt/year. Our model considers a two-phase development; with Phase-1 producing 2.5mt/year of ore and after a 3-year ramp reaches 120kt/year production. We do not ascribe any value at this stage to Phase-2 at this time. Construction of the plant and infrastructure are estimated to take between 18 to 21 months.

The resources in the current mine plan are generally situated within a shallow, oxidized and primary ore zone. The oxide zone will not require drilling and blasting operations. However, excavation of the primary ore will use the conventional drill, blast, load and haul method. A small-scale mining fleet including excavator and articulated dump trucks will be deployed for efficient mining and development of subsequent mining areas of the project.

After, treatment through the processing plant with the typical Crushing, Milling and Flotation stages, the graphite concentrate produced at Nachu will have a TGC of 99%. This is where our story for Nachu ends. However, we recognise that the concentrates carbon content would increase to 99.8% with spheroidisation and to 99.9% using the Non HF Non Chemical purification technology that was developed by MNS and C4V. The technology is owned by C4V in New York and licensed exclusively to MNS who will implement this technology in Tanzania. The exciting aspect of this technology is that like the whole process to produce Spherical graphite does not use any chemicals.

The unique crystal structure and low impurities in the Nachu graphite mineralisation allow production of a premium product suite with an average concentrate purity rating of over 98% TGC.

As the Nachu graphite has a low level of impurities, there are three key features with the C4V process;

1. A typical graphite process plant will produce a concentrate up to approximately 96% TGC. The MNS process can produce a graphite concentrate over 99% TGC only using standard processing methods
2. Upgrading the graphite concentrate from over 99% to Spherical graphite (suitable for Battery Anodes) at over 99.95% TGC, uses the C4V process and is a purely mechanical process; whereas a typical process uses chemicals. This is a key differentiator for Nachu as the absence of chemical purification, as occurs in China, means no Hydrofluoric acid or chemicals are used in the production of uncoated spherical graphite. Consequently, the process is entirely mechanical. MNS estimates that this simpler processing flowsheet results in cost savings of around US$1,000/t. This also has significant environmental advantages; and
3. IF the uncoated spherical graphite was then subjected to a patented thermal coating process, which further purifies the graphite in the process of making the final coated anode material, which has a TGC of 99.99%.

Natural graphite has a tendency to crack during repeated cycling, which leads to battery fade and a shorter battery life. However, coating the graphite with a thin layer of amorphous carbon composite reduces the formation of dendrites leading to retention of the electro conductivity of the anode material. The coated SPG is then cast onto copper foils.

Metallurgy – sustainably produced, energy dense EV battery anode material

Prior metallurgical test work indicates the Tanzanian processing plant will be designed to produce graphite concentrates in three particle sizes; ranging from jumbo flake through to small flake and fine graphite.

Within this, approximately 41% is expected to be high value Super Jumbo (+500 microns) and Jumbo (+300 microns) flake concentrate products with a purity range of 97-98%. The remaining 59% is classified as-300 micron particle sized concentrate product at an exceptional natural purity of 99.2% TGC. This target market for this product, with minimal processing to get beyond 99.5% TGC, will be the rapidly growing LIB sector.

Country Rating

The 2021 Resource Governance Index by the Natural Resource Institute awarded Tanzania a rating of 58% putting it at number 4 in Africa for resource governance. According to the group a satisfactory rating is 60%, which Tanzania achieved for 2 out of the three selective criteria. However, the effectiveness of government at the time the review was taken was low at 29%. With the death of PM Magufuli, in March 2021, the challenge for new PM Samia Suluhu Hassan is significant. Early reports have her engaging industry to ensure the right policies are in place to re-establish trust with industry.

Power, Water, Roads, Ports, transport & Storage

Graphite concentrate produced on site bagged and then trucked 220km to Mtwara. The main road from Nanganga to Mtwara is tarred, however the ~60km from the main road to the mine at Ruangwa is largely gravel based. Bags will be stored at a facility proximal to the Port of Mtwara, before shipping to customers.

Storage – The Mtwara port has recently been expanded from 2 to 4 berths giving it a handling capacity of 750,000t/year. However, despite this increase there are numerous mining projects in the region that are all looking to get product out through the port of Mtwara. We are unaware of recent progress towards securing land for storage.

Water – will be sourced initially from three bore wells, which were drilled approximately 4.5km from the project site. Water Storage dams will also be built to manage the site water and will be used as feedstock for mining and processing.

Power – MNS suggests it will need 25Mw to power a 5mt project. MNS is presently considering access to power from two sources of energy. Access to gas via a 90km pipeline from the coast and access to grid power, which is a hydro-gas mix. Gas presently comprises 57% and hydropower ~37% of the national electricity grid, which is owned by TANESCO. Power costs represent approximately 13% of the life of mine operating costs of the project (US59/t of product). Discussions with the local utility Tanzanian Power Development Corporation have been reported, however, MNS has not provided a recent update. Access to grid power might provide a greener supply of power, however timing and costings round its provision on site is not clear.

Financial Flexibility - modularisation supports possible recycling of equity

- **A SPAC listing in the US has been flagged by MNS**
- **Export/Import Credit Agencies and DOE grants also a likely source of funds**

The P+L, Cashflow & Balance Sheet

MNS currently has no revenue generation of its own…but this is all set to change in 2022. Following a debt raising and convertible note issuance, MNS is funded now through to 1GWh of capacity. In the recent quarterly cashflow report, MNS has $87.9m of cash and $68.6m of debt yielding $19.3m of net cash.

In April, **iM3NY** secured US$85m (MNS ~60%*), through a mixture of debt and equity. Of the US$85m of fund, US$50m of short dated senior debt was secured from Riverstone Credit Partners (Riverstone) at an interest rate of 12.5%. MNS is funding its equity share through cash, which was topped up by a $34m placement made earlier in the year. Also in April 3.5% holding in C4V was acquired by Riverstone Credit, and in so doing reduced MNS holding in C4V from 10% to 9.65%. In August, MNS secured A$20m, via convertible notes, from two US institutions being Lind Partners and SBC Global Investment Fund.

Battery cell Gigafactories are expensive and we estimate that a Phase-1 16GWh expansion could carry a development capex cost of ~US$$1.5Bn at US$95/GWh. A two-phase expansion to 32GWh, as proposed by **iM3NY** stakeholders, could lift costs to US$**2.8**Bn at US$90/GWh. We suspect development funding could be funded 60% debt to 40% equity against the asset **iM3NY**. Recycling cash back into the business could fund a significant amount of the equity required. Shortfalls likely funded through additional raisings. Our modelling suggests that on a risked basis, MNS could require ~$300m of funds to build out **iM3NY** to a risked capacity of 11GWh.

Normally, when assessing inherent optionality within projects that are in pre-Final Investment Decision (FID) mode, funds are risked and included within the valuation but not the P&L etc. Instead, funds only flow through the P&L etc, once FID is declared. However, that model does not work here as growth represents over 90% of MNS value. Instead, CCR runs the highly likely scenario-1 for Phase-1, & -2 of the **iM3NY** business, through the P&L, cashflow and balance sheet. This method provides insights into highly likely earnings, cashflow and balance sheet outcomes (refer tables below).

iM3NY PROJECT ANALYSIS		2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
Un-risked Project Production	GWh	0.2	0.8	1.8	3.5	6.4	10.6	18.2	20.0	23.0
Risked Project Production	GWh	0.1	0.4	1.0	1.9	3.4	5.3	8.8	9.1	9.5
Un-risked Nominal Revenues	US$m	38	161	357	664	1,112	1,657	2,451	2,698	3,263
CCR Risked Nominal Revenues	**US$m**	**21**	**88**	**196**	**365**	**585**	**834**	**1,164**	**1,219**	**1,321**
% iM3NY risking		55%	55%	55%	55%	53%	50%	47%	45%	40%

***Risking decreases - due to increased input from Phase-2 which carries a 0.15x risking against Phase-1 at 0.55x*

REAL RISKED PROJECT EBITDA	Fx	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
iM3NY	US$m	-	1	11	29	54	87	118	122	133
iM3TV	US$m	-	-	-	-	0	0	1	1	1
Nachu	US$m		-	-	-	13	42	42	42	42
	US$m									
Total REAL EBITDA	**US$m**	**0**	**1**	**11**	**29**	**67**	**130**	**161**	**166**	**176**

NOMINAL RISKED NET EBITDA	Fx	2022F	2023F	2024F	2025F	2026F	2027F	2028F	2029F	2030F
iM3NY	A$m	-	2	13	37	70	115	160	169	188
iM3TV	A$m	-	-	-	-	0	0	1	2	2
Nachu	A$m	-	-	-	-	16	56	57	58	59
Corporate Costs	A$m	(19)	(8)	(9)	(9)	(10)	(12)	(12)	(12)	(13)
Total NET NOMINAL EBITDA	**A$m**	**-19**	**-7**	**5**	**28**	**76**	**160**	**206**	**217**	**237**

** Total equity of ~60%, includes direct equity in iM3NY of 57.5%*

Funding – provided by NASDAQ listing as well as Government loans & grants

MNS has publically suggested that iM3NY may undertake a NASDAQ listing to raise funds.

Funding can be challenging at any time but particularly so if you are a small company. Companies without a credit rating, risk-having access limited to more expensive money; like project financing. Unfortunately, this usually comes with a slew of associated operational and financial caveats that risk restricting a companies operating leverage. This "chicken and egg" presents as substantial headwinds to investment.

In the US, a common means of raising new funds is via a **SPAC listing**. This has been particularly so in the battery cell space as evidenced by Solid Power (NASDAQ:SLDP), announcing plans for a US$1.2Bn SPAC deal and Enovix (NASDAQ:ENVX), went public via a US$1.13Bn SPAC deal in January 2021. Although, the effective swap of iM3NY equity interest for access to new funds will reduce existing stakeholders equity; it could also facilitate a faster build-out that CCR has modelled. With equity funding risk significantly reduced. If **US Government funds** can be secured (direct or guarantor), then the likelihood of securing "best price" **project financing and senior debt** could be achieved.

Our view is that quality projects in the EV supply chain will be in line to receive low cost direct loans from the US Government. We see **iM3NY** as one of their projects. The US Government has an AA+ credit rating, which will give offtakers much comfort. Government support would be tied to US Treasuries (at 1.5%) plus a spread.

Success here would be expected **to reduce perceived technology and operational risk and** depending on size of support could facilitate the completion of likely syndicated senior debt, at a lower cost than would normally occur. This effective "credit wrap" provided by Government support, would put **iM3NY** in a better position to secure credit worthy offtakers.

Further, the lower cost of debt lowers the company WACC and reduces the call on equity and hence dilution to shareholders and increases potential free cash flows. The combination of these two forces de-risks the project at both the Phase-1 and Phase-2 levels and in so doing; leads to an increase in valuation.

Funds from the Export/Import Bank of the US, provides a pathway to access less expensive funds as does low cost Government Loans and grants.

In 2008, a US$25Bn US Loan Program was funded by Congress and has since lent over US$8Bn in loans. As the remaining US$17Bn has already had congressional approval, allocation is expected towards EV manufacturing facilities and precursor materials plants. Subject to due diligence, funds are expected to be distributed relatively quickly. The DOE is also looking to deploy more large-scale energy storage at government owned sites.

Current Government programs that may be of assistance to MNS include:

- **The DOE's Vehicle Technology Office** $200m R&D funding grants for EV, battery and connected vehicle projects at 17 national laboratories, as well as for new partnerships to support EV manufacturing and innovation. The aim of this R&D funding is to develop innovations that will decarbonise the transportation sector.
- **Advanced Technology Vehicles Manufacturing (ATVM) Direct Loan Program** The Loan Program Office lends debt funds to quality auto manufacturing projects. – The attraction is easy to see. Long duration, senior secured, fixed rate debt at US Treasury bond rates with no credit spreads included. Basically, Government backed loans for pre-production assets at rates similar to those received by AAA corporates like JNJ and MSFT. Thus, making MNS appear substantially more attractive/less risky to the banks of a Tier-1 customer.

As business de-risks, **iM3NY** could qualify for a loan package around 2023. The ATVM website states an eligible company must;

- Be in the automotive industry and must use funds to build new or expand existing manufacturing facilities
- Have a qualified product, in this case qualified advanced materials.
- Support the processing and manufacturing in the critical minerals or metals space
- Be located in the US; and
- Have a strong cashflow, and must have a reasonable prospect of repaying funds lent.

In addition to DOE funding opportunities, there are a variety of state, local, and federal incentives, including tax credits, listed on the Alternative Fuels Data Centre that support the use of alternative fuel vehicles and infrastructure.

VALUATION SUMMARY and METHODOLOGY

There are four main component parts to the MNS valuation, which include;

1. **C4V (MNS 9.65%) – an unlisted IP company and developer of advanced LIB & SSB**
2. **Two Gigafactories (iM3NY; 32Gwh risked @ 0.34x & iM3TV; 6Gwh risked at 0.05x); and**
3. **The Nachu graphite deposit (MNS 100%) situated in Tanzania**

CCR Corporate Valuation (in A$/share)

Scenario-1	Discount Rate	POS	NOW	12-months	2-year	3-year	4-year	8-year
NACHU								
Phase-1	**10%**	**25%**	0.11	0.16	0.20	0.22	0.22	0.19
Phase-2	**10%**	**0%**	-	-	-	-	-	-
Total Nachu	**A$m**		**0.11**	**0.16**	**0.20**	**0.22**	**0.22**	**0.19**
iM3NY								
Phase-1	**10%**	**55%**	0.84	0.88	1.01	1.17	1.35	2.30
Phase-2	**10%**	**15%**	0.22	0.23	0.26	0.29	0.32	0.57
Total iM3NY			**1.06**	**1.10**	**1.27**	**1.45**	**1.68**	**2.87**
IM3TV	**10%**	**5%**	0.02	0.02	0.02	0.02	0.03	0.04
C4V			0.09	0.10	0.11	0.12	0.14	0.22
Total Operations	**A$m**		**1.28**	**1.38**	**1.60**	**1.82**	**2.06**	**3.32**
Corporate Costs	**10%**		(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Working Capital			-	0.00	0.00	0.01	0.01	0.01
Net Cash Cash (last qtr rpt-adj)			0.02	0.02	0.02	0.02	0.02	0.02
Scenario-1 LKE Forecast A$/share	**A$m**		**1.23**	**1.34**	**1.56**	**1.78**	**2.02**	**3.28**
No of diluted shares			1,098	1,195	1,195	1,195	1,195	1,195
Scenario-1 MNS Value	**A$/share**		**1.23**	**1.34**	**1.56**	**1.78**	**2.02**	**3.28**
Scenario-2 MNS Value	**A$/share**		**2.43**	**2.58**	**2.99**	**3.41**	**3.89**	**6.49**
Scenario-3 MNS Value	**A$/share**		**3.16**	**3.34**	**3.84**	**4.37**	**4.97**	**8.39**

1. **C4V – (MNS net 9.65%), is modelled using a 50%/50% blended terminal DCF and EV/Revenue multiple**.

C4V holds a direct ~37.6% equity interest in **iM3NY** and a 33% equity interest in iM3TV. These two Gigafactories will also pay C4V a revenue royalty of 1.5% annually, for the use of its IP.

iM3NY Phase-1 (16Gwh) is discounted to 0.55x and Phase-2 (16GWh) is discounted to 0.15x. Consequently, this results in two-phase discount of 0.34x for a 32GWh project. iM3TV (6GWh) is discounted to 0.05x.

On an un-risked basis, we value C4V at $3.4Bn (or US$2.4Bn). On a risked basis, we value C4V at $1.1Bn (or US$761m). This values the **MNS 9.65% holding in C4V at $102m (US$72m) or $0.09/share**). Any acceleration in the scaling of production could be expected to positively impact the valuation. The valuation methodology for C4V's component parts includes;

- **iM3NY (C4V @ ~37.6%) & iM3TV (C4V at 33%)** – We estimate a terminal DCF taking a 2036 exit cashflow and calculate a terminal value using a 3% growth rate and an 8% discount rate. We also estimate a 2036 value based on an EV/EBITDA multiple of 12x. We then blend these two values on a 50%/50% basis and discount the blended value back from 2036. Refer below for more details.
- **Royalty revenue** – We calculate a terminal DCF and an EV/Revenue multiple. We blend values on a 50%/50% basis and discount back from 2036 using a lower 6% discount rate. Values are then risked as outlined above.
    1. **Terminal DCF** – We take a 2036 unlevered free cashflow and to calculate a perpetual value we apply a growth rate of 3% and a Weighted Cost of Capital (WACC) of 6%; and
    2. **EV/Revenue multiple** –To value the gross revenue royalty we take a modelled 2036 exit revenue and apply an EV/Revenue multiple of 5x

2. **iM3NY (MNS ~57.5% direct equity) & iM3TV (MNS 33%) – modelled on a blended terminal DCF and EV/EBITDA multiple basis**

MNS holds a ~57.5% direct interest in **iM3NY** and 33% in iM3TV. The main driver for the MNS valuation is **iM3NY**, which accounts for 84.6% of the MNS value. Being so significant we take time to outline assumptions and methodologies used.

- We model **iM3NY** in two phases, each being 16GWh. The first phase of the planned 32GWh plant commences production in 2022 with a forecast output of 0.6GWh from a capacity of 1.8GWh by end of 2023. We apply a

relatively slow ramp in capacity for phase-1 to reach 8GWh by 2026 and 16GWh by 2029. We expect capacity utilization rates to be low in the front years. We model rates at 30% in 2022 rising to 75% by 2026 and 95% by 2028. We apply a conservative risk factor of 0.55x to phase-1 so that risked production for phase-1 is 3.3GWh in 2026 and 8.4GWh by 2030. We recognise, that access to low cost funds could accelerate development beyond our model.

- We assume that battery cell raw materials make up 75% of battery cell costs. The next largest category is labour, comprising ~18% of costs. Electricity costs in New York State are amongst the lowest in the US at <US$0.05/kWh. All of **iM3NY**'s green electricity will be hydro powered, as Niagara Falls is located only 34km by road. We assume that 50kWh of energy is required to produce 1kWh of battery cell.
- We use a cost plus model to achieve a running **EBITDA margin of 21%.** We recognise in the front years that this will not be achieved. We model an EBITDA margin of 3% in 2023 rising to 21% from 2027. The cost numbers used drive the top line. They are important. In the front years we assume costs of US$150/kWh in 2023 falling to US$90/kWh from 2028. Applying a 21% EBITDA margin suggests this would support a long-term real price approaching US$100/kWh…the long rumoured breakeven price with ICE cars. In reality, prices will need to decline further to engage the broader population. Scaling new technologies and **industry 4.0** will play a big role in achieving this goal.
    - A) Terminal DCF – The battery cell Gigafactory is modelled for 15-years and cashflows are discounted using a Discount rate of 10%. Using a 2036 exit post tax unlevered free cashflow, we apply a perpetual growth rate of 2.5% to land a gross un-risked terminal valuation, which is then discounted back to today. With substantial risks still ahead for the company, we de-risk Phase-1 by 0.55x and Phase-2 by 0.15x…MNS holds a ~57.5% direct equity in **iM3NY**.
    - B) EV/EBITDA multiple – We apply EV/EBITDA multiple of 12x to a 2036 exit EBITDA and discount back to today. To finish, we apply a 0.55x risking to Phase-1 and 0.15x to Phase-2. As the inherent optionality or catalysts within **iM3NY** are realised, the valuation should re-rate and the arbitrage should close.
- Using un-risked project assumptions in A+B and blending these two methods on a 50%/50% basis yields a current two-phase **iM3NY** valuation of $5.7Bn (US$4Bn). On a risked basis, which forms the basis of our company valuation, we value iM3NY at $2Bn. **Consequently, as this forms the basis of our MNS valuation, its 57.5% direct equity holding in iM3NY is $1.16Bn**. Assuming timelines are met, we recognise that value could rise significantly.
- Rising interest rates and discount rates along with cost pressures are the biggest risks to our valuation for **iM3NY**. Rising rates risk would be part mitigated by access to low cost Government funds, which with US Treasuries currently at 2.5%, would ensure sufficient headroom exists before reaching our WACC of 8%. **There is no guarantee that iM3NY will receive Federal funding; albeit we do consider it highly likely.**
- **iM3TV** – although a 18GWh plant has been proposed, in Townsville Australia, we consider a full development within the time frame suggested as unlikely. As a result, we model a smaller 6GWh plant with production from 2026 and apply a risk factor of just 0.05x (5% probability of development). Although the valuation method is the same as **iM3NY**, the discount rate applied is also higher at 10%.

  Why so low? Access to funds could be more difficult from within Australia as the projects costs base will be higher, due to more expensive power and significantly higher wages. However, in Australia cars are more expensive than in the US, and thus it is possible using a cost plus model that demand will exist. If this project can gather momentum and some BIG funding pathways become evident, valuation upside could exist. However, with little visible progress, we model a value applying a 0.05x risk factor to arrive at an iM3TV value of $19m or $0.02/share.

3. **Nachu Graphite in Tanzania – is modelled on a DCF basis**

MNS has a 100% interest in the Nachu Graphite project located in south-eastern Tanzania. Increasing capex and opex 130% from the time of the BFS in 2016, on a risked life of ore basis of 0.2x, we value Nachu at $103m or $0.10/share. If the project can be de-risked, then value could increase towards $516m.

Nachu has a 15-year life and is modelled to mine 2.5mt of ore in two separate phases. Despite the 2016 Bankable Feasibility Study (BFS) running with a 5mt/year operation, we only ascribe value to phase-1. The BFS assumptions also included a TGC grade of 5.17% and a recovery factor of 92%. If we apply these metrics, the project could produce nearly

45kt of graphite concentrate from an ore feed of 2.5mt/year. We increased the BFS capex/t and opex/t by 130% to take account of inflationary pressures and loss of synergies that would be expected from a larger mining operation.

For the smaller operation at Nachu, we assume LOM capex of US$282m and a sustaining annual maintenance cost equal to 4% of capex and an average LOM cash cost of US$684/t.

iM3NY Scenario Analysis

Each of the two phases of development that we model for iM3NY is probabilistically assessed in the context of three separate development scenarios. Effectively, each scenario values the two phases assuming differing levels of risk.

Scenario–1 forms the basis of our company valuation and as such we consider it the most likely outcome.

Within the context of scenario-1, we model;

Phase-1 – A 55% chance of success (or 0.55x of DCF). Thus value to 16GWh is discounted by 45%

This phase is already fully funded to 1.8GWh. With all new car sales in New York State, mandated to go electric by 2035 and construction of **iM3NY** underway, we ascribe a 55% probability that 16GWh, within Phase-1, will be built at Endicott. Supporting conversion to EVs, an EV buyer in New York State also receives a rebate of up to US$2,000 on qualifying EV models from participating dealers.

On a risked basis, we assume Phase-1 capacity could reach 8.8GWh and with 95% capacity utilisation that annual project production could be 8.4GWh by 2029. No other changes to assumptions are made. This forms the base case of our Phase-1 valuation.

Phase-2 – A 15% chance of success (or 0.15x of DCF). Thus value from 16Gwh to 32Gwh is discounted by 85%

Phase-1 is a proof of concept plant. As Phase-1 is de-risked, so Phase-2 will be de-risked at the margin. On a risked basis, Phase-2 could reach 1.2GWh with capacity utilisation scaling at 60%, production could be 0.7GWh by 2029.

With only 1% of all vehicles electric in New York State, demand for electric cars will surge over the coming 14-years. This said; land to expand **iM3NY** beyond 16GWh has yet to be assigned to the project. Given, the desire by local councils to build a legacy at Endicott, the vast swaths of unoccupied warehousing underwrites our model access to inexpensive hydropower. If the second tranche of battery cell Gigafactory is located anywhere else other than Tennessee, higher power costs would be expected to impact project economics but only at the margin. Under either scenario, CCR considers that valuation upside would be significant. No other changes are made to our assumptions.

Some additional assumptions used the CCR investment model include;

- **Taxes** – We assume federal taxes could rise under Bidens' *Made In America Tax Plan to 27.5%*. There are no state taxes in New York State. Government incentives for clean tech manufacturing and low cost loans are expected to more than offset upside risk to interest rates.
- **Asset depreciation** – We model on a straight-line basis over 10-years
- **Initial capex** – Manufacturing efficiencies could provide for additional upside.
- **Sustainable capex** – We model at 2% of capex cost/t of installed capacity. We lag maintenance capex by 4 years
- **Cost of goods sold** – We assume the long-term cost to produce a cell is US$90/kwh from 2026.
- **Funding** – This is where the debate occurs. The lowest cost source of funds could be a Treasury based loan from the Advanced Technology Vehicles Manufacturing (ATVM) Direct Loan Program. We assume 25% of funds required by **iM3NY**, to meet capex forecasts, will be debt funded with the remaining from equity sources. Increased Government support would lower cost of funds and provide valuation upside. Currently, a Treasury based Government loan might accrue an interest rate of 1.5-3% versus corporate bonds at around ~12.5%. Increased access to capital would reduce the amount of equity required and reduce the dilution currently modelled; and
- **Capital Management –** Due to the scalability and modular nature of the build-out, we consider that cashflow generated could be recycled from one modular development to the next. The end result is that the business could be expanded and the call on new equity reduced.

Scenario Analysis around iM3NY two phase development only

We run three scenarios with varying levels of risk applied to each of the two development phases for **iM3NY** business. As catalysts are executed, the probability of each phase goes up. As this occurs, scenario-2 becomes more likely and as production is commissioned and scales, then scenario-3 becomes more likely

SCENARIO-1* this is the CCR investment model **Includes a 55% probability for Phase-1 & 15% for Phase-2 (overall 34%).**

PRODUCTION (in Gwh)	RISKED	2022F	2023F	2024F	2025F	2030F
iM3NY Production	Project Risking					
Phase-1 to 16Gwh	55%	0.1	0.3	0.6	1.1	4.8
Phase-2 to 32Gwh	15%	-	-	-	-	0.7
Net Risked Production	**Gwh**	**0.1**	**0.3**	**0.6**	**1.1**	**5.5**
iM3NY NOMINAL EBITDA	**A$m**	**-**	**2**	**13**	**37**	**188**
EV/Ebitda	A$m	**#DIV/0!**	**225.9x**	**30.5x**	**10.9x**	**2.2x**
VALUATION (in A$)	**Now**	**1-year**	**2-year**	**3-year**	**4-year**	**8-year**
Phase-1 to 16Gwh	0.84	0.88	1.01	1.17	1.35	2.30
Phase-2 to 32Gwh	0.22	0.23	0.26	0.29	0.32	0.57
Total iM3NY Business	**1.06**	**1.10**	**1.27**	**1.45**	**1.68**	**2.87**

Scenario–1

Installed Capacity

Un-risked capacity at 5GWh by 2025; and 28GWh by 2030

Risked Production

Capacity utilisation rates of 80% in 2030; suggest risked two phase production at 9.5GWh

SCENARIO-2* Assumes Phase-1 is fully developed and Phase-2 is risked at 50%

NET PRODUCTION (in Gwh)	RISKED	2022F	2023F	2024F	2025F	2030F
iM3NY Production	Project Risking					
Phase-1 to 16Gwh	100%	0.1	0.5	1.0	2.0	8.7
Phase-2 to 32Gwh	50%	-	-	-	-	2.2
Net Risked Production	Gwh	**0.1**	**0.5**	**1.0**	**2.0**	**11.0**
EBITDA	**A$m**	**-**	**82**	**280**	**368**	**588**
EV/Ebitda	A$m	**0.0x**	**4.9x**	**1.4x**	**1.1x**	**0.7x**
VALUATION in A$	**Now**	**1-year**	**2-year**	**3-year**	**4-year**	**8-year**
Phase-1 to 16Gwh	1.52	1.59	1.84	2.12	2.46	4.18
Phase-2 to 32Gwh	0.73	0.76	0.85	0.96	1.08	1.90
Total iM3NY Business	**2.25**	**2.35**	**2.69**	**3.08**	**3.54**	**6.08**

Scenario–2

Installed Capacity

Un-risked capacity at 5GWh by 2025; and 28GWh by 2030

Risked Production

Suggests risked 2 phase production in 2030 at 19GWh

SCENARIO-3* - Assumes both phases are fully developed – we are no where near this scenario at this stage

PRODUCTION (in Gwh)	UN-RISKED	2022F	2023F	2024F	2025F	2030F
iM3NY Production	Project Risking					
Phase-1 to 16Gwh	100%	0.1	0.5	1.0	2.0	8.7
Phase-2 to 32Gwh	100%	-	-	-	-	4.5
Net Un-risked Production	Gwh	**0.10**	**0.46**	**1.04**	**2.01**	**13.23**
EBITDA	**A$m**	**-**	**61**	**177**	**323**	**974**
EV/Ebitda	Ratio	**0.0x**	**6.6x**	**2.3x**	**1.3x**	**0.4x**
VALUATION in A$	**Now**	**1-year**	**2-year**	**3-year**	**4-year**	**8-year**
Phase-1 to 16Gwh	1.52	1.59	1.84	2.12	2.46	4.18
Phase-2 to 32Gwh	1.46	1.51	1.71	1.92	2.16	3.80
Total iM3NY Business	**2.98**	**3.10**	**3.54**	**4.04**	**4.62**	**7.97**

Scenario-3

Installed Capacity

Un-risked capacity at 5GWh by 2025; and 28GWh by 2030

Risked Production

Suggests risked 2 phase production in 2030 at 23GWh

A$ Earnings

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A$ Earnings

RISKED EARNINGS FORECAST, CASHFLOW & BALANCE SHEET

PRICE: A$0.45

PROFIT AND LOSS (Year End June)

Year ending 30 June	Unit	2021F	2022F	2023F	2024F	2025F	2026F
Revenue	A$m	1	14	60	133	247	418
Expenses	A$m	(17)	(33)	(66)	(128)	(219)	(342)
EBITDA	A$m	**(16)**	**(19)**	**(7)**	**5**	**28**	**76**
Depreciation	A$m	(0)	(1)	(3)	(7)	(14)	(31)
EBIT	A$m	(16)	(20)	(10)	(2)	14	45
Net interest (expense)	A$m	0	-	-	(5)	(11)	(11)
NPBT	A$m	**(16)**	**(20)**	**(10)**	**(8)**	**3**	**34**
Tax expense	A$m	-	-	-	-	-	(0)
NPAT (pre-abnormal)	A$m	**(16)**	**(20)**	**(10)**	**(8)**	**3**	**34**
Abnormal items	A$m	-	-	-	-	-	-
NPAT (reported)	A$m	**(16)**	**(20)**	**(10)**	**(8)**	**3**	**34**

CASH FLOW

Year ending 30 June	Unit	2021F	2022F	2023F	2024F	2025F	2026F
OPERATING CASHFLOW							
NPAT	A$m	(16)	(20)	(10)	(8)	3	34
Add: non-cash items	A$m	(0)	-	-	-	-	-
Change in working capital	A$m	-	-	-	-	-	(2)
Operating cash flow	A$m	**(16)**	**(20)**	**(10)**	**(8)**	**3**	**32**
INVESTING CASHFLOW							
PP&E	A$m	(42)	(7)	(29)	(84)	(80)	(102)
Exploration & evaluation	A$m	-	-	-	-	-	-
Sustaining capital (from 2028)	A$m	(0)	(0)	(1)	(1)	(3)	(7)
Rehabilitation charge	A$m	-	-	-	-	-	(0)
Investing cash flow	A$m	**(42)**	**(7)**	**(30)**	**(85)**	**(83)**	**(109)**
FINANCING CASHFLOW							
Share issues	A$m	85	50	-	-	-	-
Project equity	A$m	-	-	117	-	-	-
Project debt	A$m	-	-	175	-	-	-
Other	A$m	43	-	-	-	-	-
Financing cash flow	A$m	**129**	**50**	**292**	**-**	**-**	**-**
Surplus Cashflow	A$m	71	23	253	(93)	(79)	(76)

BALANCE SHEET

Year ending 30 June	Unit	2021F	2022F	2023F	2024F	2025F	2026F
ASSETS							
Cash (incl. raising)	A$m	73	97	353	268	203	158
Accounts receivable	A$m	20	20	20	20	20	22
PP&E (Capex - depreciation)	A$m	28	76	74	153	180	257
Exploration & evaluation asset	A$m	15	15	15	15	15	15
Other	A$m	0	-	-	-	-	0
Total assets	A$m	**137**	**209**	**463**	**456**	**418**	**452**
LIABILITIES							
Creditors	A$m	4	2	2	2	2	2
Provisions	A$m	0	-	-	-	-	-
Borrowings	A$m	65	-	175	175	175	175
Other	A$m	0	0	0	0	0	0
Total liabilities	A$m	**69**	**2**	**177**	**177**	**177**	**178**
SHAREHOLDER'S EQUITY							
Share capital	A$m	198	248	365	365	365	365
Reserves	A$m	12	12	12	12	12	12
Retained earnings	A$m	(143)	(43)	(53)	(61)	(57)	(23)
Total equity	A$m	**67**	**217**	**324**	**317**	**320**	**354**
Diluted weighted average NoS	m	929	1,098	1,195	1,195	1,195	1,195

RATIOS

ASSETS	Unit	2021F	2022F	2023F	2024F	2025F	2026F
Net Cash (Debt)	A$m	8	97	178	93	27	(18)
Net Debt/Equity	%	0%	0%	0%	0%	0%	5%
EPS	cps	-	(0)	(0.01)	(0.01)	0.00	0.03
PE ratio	ratio	-	-25.0x	-55.6x	-70.9x	158.0x	15.8x
Ebitda ratio	ratio	-	-	-0.1x	0.0x	0.1x	0.2x
EV/Ebitda ratio	ratio	-	-	-61.9x	89.5x	14.7x	5.3x

PRODUCTION ESTIMATES (Net)

Year ending 30 June	Unit	2022F	2023F	2024F	2025F	2026F
PROJECTS						
Nachu contained graphite	t	-	-	-	-	38,775
Nachu graphite concentrate	t	-	-	-	-	35,673
NET iM3NY gigafactory	Gwh	0.1	0.3	0.6	1.1	1.9
NET iM3TV gigafactory	Gwh	-	-	-	-	-

PRICING & FOREX ASSUMPTIONS

Year ending 30 June	Unit	2022F	2023F	2024F	2025F	2026F
PRICES						
+500 micron (Super Jumbo)	US/kg	4,000	4,100	4,203	4,308	4,415
+300 micron (Jumbo)	US/t	2,000	2,050	2,101	2,154	2,208
Sub 300 micron (EV battery ma	A$/t	1,500	1,538	1,576	1,615	1,656
CURRENCY						
AUD/USD	A$/US$	0.85	0.85	0.85	0.85	0.85

MARKET MODEL

Year ending 30 June	Unit	
Market cap	A$m	435
Current Cash	A$m	99
Current Debt	A$m	(69)
Enterprise value (EV)	A$m	**405**
EV / NPV10		**22%**
Net cash % market cap	%	**7.0%**
No of ordinary shares	m	967

DISCOUNTED CASHFLOW MODEL - Refer Scenario–1 SNAPSHOT

Nominal NPV10 (Post tax)	Discount Rate %	Unrisked NPV (A$m)	Unrisked A$/sh	Risking	Risked NPV (A$m)	Risked A$/sh
Nachu Graphite Phase-1	10%	487	0.44	25%	122	0.11
Nachu Expansion Phase-2	10%	-	-	0%	-	-
Total Nachu Value		**487**	**0.44**		**122**	**0.11**
iM3NY Phase-1	10%	1,673	1.52	55%	920	0.84
iM3NY Phase-2	10%	1,604	1.46	15%	241	0.22
Total iM3NY Value		**3,277**	**2.98**	**35%**	**1,161**	**1.06**
iM3TV	10%	372	0.34	5%	19	0.02
C4V (MNS net 9.65%)		288	0.26	35%	102	0.09
-Corporate Costs	10%	(69)	(0.06)	100%	(69)	(0.06)
-/+Working Capital	10%	-	-	100%	-	-
+Net Cash		19	0.02	100%	19	0.02
Equity value		**4,375**	**3.98**		**1,353**	**1.23**

Equity value		1,353
NoSh - fully diluted (m)		1,098
Value NOW	**A$/share**	**1.23**
Value 12 months out	**A$/share**	**1.34**

VALUATION SENSITIVITIES

GRAPHITE PRICES		US$/t	$m	$/sh	% diff
	Base	1,585	1,353	1.23	
-500	Low	1,335	1,286	1.17	-5%
+500	High	2,385	1,441	1.31	6%
EXCHANGE RATE (long term)		**AUD/USD**	**$m**	**$/sh**	**% diff**
	Base	0.75	1,353	1.23	
+0.1	Low	0.85	1,189	1.08	-12%
-0.1	High	0.65	1,595	1.45	18%
WACC (post tax)			**$m**	**$/sh**	**% diff**
	Base	10.0%	1,353	1.23	
-1%	Low	9.0%	1,597	1.45	18%
+1%	High	11.0%	1,176	1.07	-13%

MAGNIS ENERGY TECHNOLOGIES

CORPORATE CONNECT

US$ Earnings

RISKED EARNINGS FORECAST, CASHFLOW & BALANCE SHEET

PRICE: US$0.32

PROFIT AND LOSS (Year End June)

Year ending 30 June	Unit	2021F	2022F	2023F	2024F	2025F	2026F
Revenue	US$m	1	10	43	96	178	301
Expenses	US$m	(12)	(24)	(48)	(92)	(158)	(246)
EBITDA	US$m	**(12)**	**(14)**	**(5)**	**3**	**20**	**55**
Depreciation	US$m	(0)	(0)	(2)	(5)	(10)	(23)
EBIT	US$m	(12)	(14)	(7)	(2)	10	32
Net interest (expense)	US$m	0	-	-	(4)	(8)	(8)
NPBT	US$m	**(12)**	**(14)**	**(7)**	**(5)**	**2**	**25**
Tax expense	US$m	-	-	-	-	-	(0)
NPAT (pre-abnormal)	US$m	**(12)**	**(14)**	**(7)**	**(5)**	**2**	**25**
Abnormal items	US$m	-	-	-	-	-	-
NPAT (reported)	US$m	**(12)**	**(14)**	**(7)**	**(5)**	**2**	**25**

CASH FLOW

Year ending 30 June	Unit	2021F	2022F	2023F	2024F	2025F	2026F
OPERATING CASHFLOW							
NPAT	US$m	(12)	(14)	(7)	(5)	2	25
Add: non-cash items	US$m	(0)	-	-	-	-	-
Change in working capital	US$m	-	-	-	-	-	-
Operating cash flow	US$m	**(12)**	**(14)**	**(7)**	**(5)**	**2**	**25**
INVESTING CASHFLOW	US$m						
PP&E	US$m	(30)	(5)	(21)	(60)	(57)	(73)
Exploration & evaluation	US$m	-	-	-	-	-	-
Sustaining capital (from 2028)	US$m	(0)	(0)	(0)	(1)	(2)	(5)
Rehabilitation charge	US$m	-	-	-	-	-	(0)
Investing cash flow	US$m	**(30)**	**(5)**	**(21)**	**(61)**	**(60)**	**(78)**
FINANCING CASHFLOW	US$m						
Share issues	US$m	61	36	-	-	-	-
Project equity	US$m	-	-	84	-	-	-
Project debt	US$m	-	-	126	-	-	-
Other	US$m	31	-	-	-	-	-
Financing cash flow	US$m	**93**	**36**	**210**	**-**	**-**	**-**
Surplus Cashflow	US$m	51	17	182	(67)	(57)	(54)

BALANCE SHEET

Year ending 30 June	Unit	2021F	2022F	2023F	2024F	2025F	2026F
ASSETS							
Cash (incl. raising)	US$m	52	70	254	193	146	113
Accounts receivable	US$m	14	14	14	14	14	16
PP&E (Capex - depreciation)	US$m	20	55	53	110	130	185
Exploration & evaluation assets	US$m	11	11	11	11	11	11
Other	US$m	0	-	-	-	-	0
Total assets	US$m	**98**	**150**	**333**	**328**	**301**	**326**
LIABILITIES							
Creditors	US$m	3	1	1	1	1	2
Provisions	US$m	0	-	-	-	-	-
Borrowings	US$m	47	-	126	126	126	126
Other	US$m	0	0	0	0	0	0
Total liabilities	US$m	**50**	**1**	**128**	**128**	**128**	**128**
SHAREHOLDER'S EQUITY							
Share capital	US$m	143	179	263	263	263	263
Reserves	US$m	9	9	9	9	9	9
Retained earnings	US$m	(103)	(31)	(38)	(44)	(41)	(17)
Total equity	US$m	**49**	**156**	**233**	**228**	**230**	**255**
Diluted weighted average NoSh	m	929	1,098	1,195	1,195	1,195	1,195

RATIOS

ASSETS	Unit	2021F	2022F	2023F	2024F	2025F	2026F
Net Cash (Debt)	US$m	6	70	128	67	20	(13)
Net Debt/Equity	%	-	-	0%	0%	0%	5%
EPS	cps			(0.01)	(0.00)	0.00	0.02
PE ratio	ratio	-	-	-77.3x	-98.5x	219.4x	21.9x
Ebitda ratio	ratio	(22)	(1)	-0.1x	0.0x	0.1x	0.2x
EV/Ebitda ratio	ratio	-	-	-40.9x	59.2x	9.7x	3.5x

PRODUCTION ESTIMATES (Net)

Year ending 30 June	Unit	2022F	2023F	2024F	2025F	2026F
PROJECTS						
Nachu contained graphite	t	-	-	-	-	38,775
Nachu graphite concentrat	t	-	-	-	-	35,673
NET iM3NY gigafactory	Gwh	0.1	0.3	0.6	1.1	1.9
NET iM3TV gigafactory	Gwh	-	-	-	-	-

PRICING & FOREX ASSUMPTIONS

Year ending 30 June	Unit	2022F	2023F	2024F	2025F	2026F
PRICES						
+500 micron (Super Jumbo)	US/kg	4,000	4,100	4,203	4,308	4,415
+300 micron (Jumbo)	US/t	2,000	2,050	2,101	2,154	2,208
Sub 300 micron (EV battery ma	A$/t	1,500	1,538	1,576	1,615	1,656
CURRENCY		-	-	-	-	-
AUD/USD	A$/US$	0.85	0.85	0.85	0.85	0.85

MARKET MODEL

Year ending 30 June	Unit	
Market cap	US$m	313
Cash	US$m	71
Debt	US$m	(49)
Enterprise value (EV)	US$m	**193**
EV / NPV10		**22%**
Cash % market cap	%	**7%**
No of shares (undiluted)	m	967

DISCOUNTED CASHFLOW MODEL - Refer Scenario–1 SNAPSHOT

Nominal Post tax	Discount Rate %	Unrisked NPV (US$m)	Unrisked US$/sh	Risking	Risked NPV (US$m)	Risked US$/sh
Nachu Graphite Phase-1	10%	350	0.32	25%	88	0.08
Nachui Expansion Phase-2	10%	-	-	0%	-	-
Total Nachu Value		**350**	**0.32**		**88**	**0.08**
iM3NY Phase-1	10%	1,205	1.10	55%	662	0.60
iM3NY Phase-2	10%	1,155	1.05	15%	173	0.16
Total iM3NY Value		**2,360**	**2.15**		**836**	**0.76**
iM3TV	10%	268	0.24	5%	13	0.01
C4V (MNS net 9.65%)		207	0.19	35%	73	0.07
-Corporate Costs	10%	(50)	(0.05)	100%	(50)	(0.05)
-/+Working Capital	10%	-	-	100%	-	-
+Net Cash		14	0.01	100%	14	0.01
Equity value		**3,150**	**2.87**		**974**	**0.89**

Equity value		**974**
NoSh - fully diluted (m)		1,098
Value NOW	**US$/share**	**0.89**
Value 12 months out	**US$/share**	**0.96**

VALUATION SENSITIVITIES

GRAPHITE PRICES		US$/t	US$m	US$/sh	% diff
	Base	2,000	974	0.89	
-500	Low	1,500	926	0.84	-11%
+500	High	2,500	1,038	0.94	0%
EXCHANGE RATE (long term)		**AUD/USD**	**$m**	**$/sh**	**% diff**
	Base	0.75	974	0.89	
+0.1	Low	0.85	856	0.78	-18%
-0.1	High	0.65	1,148	1.04	11%
WACC (post tax)			**$m**	**$/sh**	**% diff**
	Base	8.0%	974	0.89	
-1%	Low	7.0%	1,150	1.04	11%
+1%	High	9.0%	847	0.77	-18%

2. BOARD and MANAGEMENT

Frank Poullas Executive Chairman	**Frank Poullas**, was appointed Chairman in September 2010 and has spent over two decades working in the technology, investment banking and engineering sectors. During the last 15 years, he has been involved with assisting several public entities with funding and strategic direction, which has resulted in increased shareholder value. Frank sits on the Board of C4V, iM3NY, iM3TV and also continues to consult with public companies involved or looking at entering the lithium-ion battery material sector.
Professor Stanley Whittingham Non-Executive Director	**Professor M. Stanley Whittingham,** joined the MNS Board in November 2016 and has nearly five decades of experience in the lithium-ion battery industry and is best known for being a pioneer in the development of lithium- ion batteries which has earned him the prestigious award of the 2019 Nobel Prize in Chemistry. During his illustrious career Professor Whittingham has headed large projects for the US Department of Energy, Exxon, and Schlumberger. He has 16 US patents and has been involved in writing over 340 pieces of scientific and engineering literature. Currently, he is a SUNY Distinguished Professor of Chemistry and Materials Science and Engineering at Binghamton University, which is part of the State University of New York. Professor Whittingham is also Director of the NorthEast Center for Chemical Energy Storage (NECCES) and holds a BA. Chemistry; a DPhil. Chemistry and an MA from Oxford University, England**.**
Mona Dajani Executive Director	**Mona Dajani,** joined the MNS Board in March 2021 and has over 20 years of practise experience as a dual qualified lawyer in the U.S. and England and as a licensed professional engineer. She serves as a lead lawyer in complex acquisitions, dispositions, financing, and project development transactions involving energy and infrastructure facilities in the United States and around the world. Mona is co-leader of Pillsbury Winthrop Shaw Pittman's Energy and Infrastructure Projects Team and leads the Renewable Energy practice.
Zarmeen Pavri Non-Executive Director	**Zarmeen Pavri**, joined the MNS Board in March 2021 and has over 25 years' experience within the financial services sector, specifically in funds management focused on impact investing, ESG and venture capital. She has a wide range of experience both locally and overseas and has a multidimensional background across strategy development, investment, risk and compliance governance, sustainability, commercialisation, and organisational transformation. She is a Non-Executive Director of Uniting Ethical Investors Ltd, Chair of the Apostle Ethical and Impact Advisory board, and sits on various advisory committee panels. Zarmeen is a Partner at SDGx Ventures, an Impact VC investment management and advisory group and further holds the position as the Oceania Regional Senior Advisor at The Global Impact Investing Network (GIIN). Zarmeen is a qualified Australian Chartered Accountant and has a Bachelor of Commerce (sub major Law) degree from University of Western Sydney.
Mugunthan Siva Non-Executive Director	**Mugunthan Siva**, joined the MNS Board in March 2021 and possesses three decades of experience in the finance industry both locally and overseas, specializing in funds management. He is the Managing Director, Chief Investment Officer and co-founder of India Avenue, which is a business focused on providing advice and delivering client focused investment solutions to investors seeking to access India's strongly growing capital markets. Mugunthan was Head of Portfolio Management for ANZ Wealth, Investment Strategist at ING Investment Management Australia and Chief Investment Officer for ING Investment Management India. He has also worked for Westpac, Macquarie Bank, ING Bank and Retire Invest. Mugunthan holds a Bachelor of Commerce from UNSW and a Masters of Business from UTS.
Peter Tsegas Non-Executive Director	**Peter Tsegas**, joined the MNS Board in June 2015 and has 20 +years of experience in Tanzania where he's been a resident for the past 15 years. He has worked to engage both the private and government sectors on several projects and was Managing Director of Tancoal Energy Ltd, which he successfully took from an exploration company to a JV with the Tanzanian government, and then into production.

5. COMPANY RISKS

Significant risks are associated with the development and commissioning of any operation. The main risk areas include the scaling of BM–LMP cell chemistry and manufacturing capacity, the effectiveness of manufacturing automation and cost pressures.

We assess key business risks as:

- **US Political Risk** – Over the next 3 years political risk, as far as the environment and EVs is concerned, is relatively low now that the US$1.2T Infrastructure Bill has been signed. Already the US is running behind China and Europe in terms of global EV output forecasts, which are currently surging. Tesla, as we all know, is doing a fantastic job all on its own. But the CEO Elon Musk knows it is not enough - more needs to be done. GM, Ford, VW and Stellantis etc. are welcomed into the EV space and required. The US has a chance to build out their automotive industries in belts where unemployment is high. The new Administration is grabbing the once-in-a-generation chance to revitalise its economy
- **Market Risk** – Mitigated by the surge in EV demand and the current increased interest in phosphate rich cathode chemistry and the use of graphite in the anode, which makes up 50% of the battery. Further, EV demand forecasts are surging, supply chains are localising away from China and EV green deal initiatives in the US are building momentum
- **New Disruptive Technology Risk** – C4V (MNS 9.65%), is itself a battery materials disruptor. C4V is an R&D company, with access to scientists out of Binghamton University. C4V's semi SSB has already been qualified and is currently before major OEM's. **iM3NY** partners include, Itochu, MARTAC, Primet Precision and C4V
- **Construction Risk** – **iM3NY** is working through a design FEED with Danish Engineering Firm, Ramboll. The company is a global leader in creating sustainable engineering solutions.
- **Execution Risk –** Addresses project management of technical, organisational, logistical and supply chain management to mention a few. Don't get this right and project delays result. Dr Sharma, the CEO of **iM3NY,** was an ex senior member of the Tesla team that developed Giga Nevada
- **Scaling Risk –** Remains as it does with all operations and is, in part, mitigated through the use of modules. A simplified manufacturing process and the ability to drop new technology into the existing manufacturing infrastructure on the factory floor
- **Manufacturing Risk** – Advanced AI, Big Data and automation if effectively installed should reduce manufacturing risk by better predicting and managing maintenance, reducing downtime, optimising supply chain management, better management of inventory, increasing output and reducing costs.
- **Technology/Substitution Risk** – This risk is real as it is the job of science to improve on what already exists. This is mitigated somewhat by a manufacturing process that enables the easy drop in of new technology into the manufacturing process
- **Liquidity, Funding and Dilution Risk** – COVID has hammered home the importance of having a Board approved liquidity and crisis management framework. Capex over coming years will be significant and liquidity will need to be carefully managed. This is mitigated, in part, by the high quality Board and commitment by the DOE to facilitate funding through loans and grants. Further, the US$1.2Tn Infrastructure Bill has just been signed and a substantial amount of funds are destined for the EV ecosystem. Additional funds can also be raised through project equity sell-downs, the issuance of new equity and structured off-take deals
- **Country Risk** – Is low and mitigated by the Standard & Poor's AA+ rating for the USA. Other ratings agencies, like Moody's and Fitch, still rate the USA a AAA but presently have it on a negative watch
- **Crisis Risk Management** – This continues to fluctuate as it does around the entire world. The vaccination rollout will, in part, mitigate interruption as we lean to live with the virus. However, lockdown risk is ever present and could negatively impact the construction and start-up schedule; and
- **Forex and Commodity Price Risk** – Fluctuations in commodity, anode and cathode prices and currencies may adversely impact the company's earnings and valuation.

MAGNIS ENERGY TECHNOLOGIES

Top 20	Shareholder Name	30-Nov-21	%Total Shares
1	CITICORP NOMINEES PTY LIMITED	62,164,497	6.43%
2	MAZZDEL PTY LIMITED	54,535,853	5.64%
3	SMARTEQUITY EIS PTY LTD	20,750,000	2.14%
4	MR MATTHEW JOHN BOYSEN	19,709,464	2.04%
5	MR FRANK POULLAS	17,209,871	1.78%
6	BNP PARIBAS NOMINEES PTY LTD	13,105,622	1.35%
7	MR LINPING FU	12,650,000	1.31%
8	COMSEC NOMINEES PTY LIMITED	10,203,916	1.05%
9	MR TIAN YONG LIU & MRS WEI YING JIANG	6,221,498	0.64%
10	JKB ALPHA PTY LTD	5,000,000	0.52%
11	MR MARLON PATHER	5,000,000	0.52%
12	SBC GLOBAL INVESTMENT FUND	4,700,000	0.49%
13	HSBC CUSTODY NOMINEES (AUSTRALIA) LIMITED	4,398,563	0.45%
14	KINGSLAND DEVELOPMENTS AUSTRALIA PTY LTD	4,383,032	0.45%
15	MS RUIE YAO	4,265,000	0.44%
16	MR JOHN PETER SAUNIG	4,179,322	0.43%
17	MISS HAZEL DARCY	4,119,921	0.43%
18	DR CRAIG GEOFFREY SURTEES	4,114,363	0.43%
19	MERRILL LYNCH (AUSTRALIA) NOMINEES PTY LIMITED	4,099,641	0.42%
20	KMJ CONSULTING PTY LTD	3,921,387	0.41%
TOP 20		**264,731,950**	**27.37%**

Source: Link Market Services and Magnis Energy Technologies

Year	iM3NY Timeline Achievements
2012	Company formed
2014	Developed 100+patents and Ni & cobalt free LIB
2018	Pilot testing commenced
2019	**iM3NY** plant announced
2020	Signed over US$700m in contracts
2021	Gigafactory production commences
	Future Plans
2022	Planned shipping to customers
to 2030	Aim is to be involved in 10 Gigafactories globally

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