



# Compressed Air Electric Vehicles (CAEVs)

Australasia as a Vehicle Manufacturer



The Veolia commissioned MDI waste vehicle operating on the streets of Lille in France. An example of a successful industrial relationship.

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## I RUN ON AIR

Recreational light commercial vehicle demonstrates the modularity of MDI CAEV models.

Exhibited at the Dubai World Expo as a big hit.

## INTRODUCTION

### How we address the decarbonisation production challenge

In a new transport era marked by the replacement of the dominant Internal Combustion Engine Vehicles (ICEs) by cleaner running vehicles, the replacement landscape is dominated by Battery Electric Vehicles (BEVs). There are also less plug in Hybrid Electric Vehicles (PHEV), and far less prevalent Hydrogen Electric Vehicles, or Fuel Cell Electric Vehicles (FCEV). The whole transition is referred to as electrification.

The logical reason for battery's dominance is that batteries were already a mature technology in other fields, and they have a good round trip efficiency and acceptable energy density (though less than gasoline or hydrogen). To the contrary batteries are reputed for limited duration or range, being relatively expensive and heavy, and having a carbon footprint from their production. Currently, in essence, batteries is all there is.

For transport industry decarbonising (decarbonising goes much further than electrification), a contextual argument is that battery electric vehicles do not create emissions "at the tail pipe", which is valid. But from an operating perspective that assumes only renewables charging, a direction we are taking, but most importantly batteries are not produced cleanly, a direction we are not yet taking, and one very difficult to do.

Into the electrification fold we introduce Compressed Air Electric Vehicles (CAEVs), to contribute to transport electrification and to go the step further to decarbonisation via clean production. However, whilst we address herein the CAEV clean procurement, production and distribution decarbonisation footprint compared to BEVs and other technologies, that is not why we are here. The political and production landscape for current electrification technologies have too much entrenchment for us to make any commercial impact, nor does that landscape have agreed electrification lifecycle assessments, due in part to the huge future uncertainties.

### How we address the electrification market challenge

Rather we are here to contribute to customers' and markets' greater electrification take up via our targeted vehicle models and diverse applications, and their affordability and appeal. In other words to address the gaps relating to underserved markets and bespoke market requirements. In doing so we seek to create a regional vehicle manufacturing industry, initially across Australasia, and then with global replication.

We will seek to demonstrate clean vehicle production and operation, and to use local renewables and energy storage (our compressed air energy storage).

We can create a micro Australasian auto industry that is decarbonised from day 1 and a contributor to the Australian renewables powerhouse goal and its promotion. Once commenced in Australasia (Australia, New Zealand, Pacific Islands, and a look to SE Asia), we will replicate globally the process, though not automatically all products. The supply chain will be secure – a rarity in future.

### Who we are and why CAEV technology

A popular marketing phrase is “it’s not about the product but the experience”. For the CAEV business this has special significance as we can adapt products directly to the regional markets via regional manufacture. For example well known markets like the UK and the USA are very different, but traditional manufacturers don’t focus on market by market due to economies of scale. Hence the electric vehicle model supply shortage.

So we design vehicles directly in response to neglected markets currently not electrifying due to lack of service, as well as promote to all markets and major customers the tailored bespoke capability. We can be so specific due to our modularity, construction and regional manufacture. Never can that be undertaken by traditional mainstream auto, who build upon greater uniformity and centralised economies of scale. CAEV technology provides unique electrification products to better enable achievement of the 2030 transport industry climate goals.

For over two decades MDI, the European based CAEV technology company, and AFG, the Australasian commercialisation company, have been collaboratively dedicated to matching the technology capability to regional markets. In addressing the growing concern observed at the pace of transport decarbonisation and its reliance on end product electrification, our goal has been redefining the landscape of transportation through cutting-edge solutions. MDI, with their development team of visionaries and engineers, along with the AFG team on the ground in Australasia and near the markets, together understand the needs and gaps, and are now focusing on mass commercialisation and replicability to cater to them.

MDI during their technology innovation, harnessed the sciences of AI, digital, materials, mechanics and thermodynamics to work with an infinite renewables resource – air. And patented that. They collaborated with some of the leading industrial businesses, such as Tata Motors in India, Veolia in France, KLM Airlines in Netherlands, the World Expo in Dubai, and were awarded by United Nations.

### Australasian mass commercialisation and global replication

The partners AFG and MDI identified three key reasons to select Australasia for mass commercialisation.

- **Diversity under one roof:** Australia, New Zealand, and Pacific Islands are a unique geography globally to address multi regions and cultures in one area proximity, with politically, scientifically and financial receptive attitudes to abatement of adverse climate change.
- **Market opportunity:** We sought transport market diversity across various regions in proximity to establish the production and customer bases potentially benefitting from the technology.
- **Courage to innovate:** Australia promotes its objective as a renewables powerhouse. Rather than just produce and export renewables energy we seek to create the same opportunity for transport.

*All preparation, innovative design, and commissioned products up to this point have been in preparation for mass commercialisation. It is the turning point and the aspiration.*

### What We Intend

Our intention is to establish and roll out regional manufacture in Australasia, powered by local renewables, to build a presence servicing neglected and bespoke transport markets, and to progressively roll out global replication. We seek to do so with minimal and required capital, and build a profitable business, largely financed regionally as we grow, whilst creating a reputation for customer experience and employment.



The World Expo in Dubai commissioned MDi CAEV AirTrains to transport visitors around the campus, lasting 6 months, 6 trains, 23 million visitors, and onsite superfast refill.

## EXECUTIVE SUMMARY

*Introducing the Compressed air electric vehicles' (CAEVs) technology, markets and manufacture to address the further solutions that are needed for the automotive industry to improve sustainability for everyone.*

In the pursuit of a sustainable and market diverse decarbonised transportation industry, Compressed Air Electric Vehicles (CAEVs) emerge as a transformative force to fill numerous glaringly apparent shortcomings, before band-aid solutions become too politically and commerciality prevalent. For an example, in Australia, limited models supply and affordability. The aim is percentage of electrified vehicles goals and less carbon.

Unapologetically, challenging conventional and evolving norms in the automotive industry, we do not seek to be critical of those who share our goals and pave the way, but rather to supplement them with alternatives and additions. With this objective in mind we do outline our core differentiations, strategic advantages, and innovative approaches that set CAEVs apart from traditional Battery Electric Vehicles (BEVs), with an aim in doing so to service current market gaps and niches, and identify and create a new bespoke marketplace.

Again to be clear – we are not seeking to benchmark a new entrant such as CAEVs against an established one such as BEVs. Rather we firmly agree, along with the IPCC and COP climate groups, when they express that climate abatement needs all hand on deck. BEVs are established across the mainstream legacy automobile industry, but their basic commercial platforms leave entrenched gaps – the result not only of production and market commercialisation norms for established players, but also of the technologies being adopted.

This document is structured into the following four key sections, each delving into specific facets that collectively showcase the unique strengths of CAEVs and our intention for their mass commercialisation.

### 1. Decarbonising Vehicle Production

The opening section highlights the too-slow pace of decarbonisation in the transport electrification journey, which underscores the urgency for additional transformative solutions. This slowness can be attributed to various factors: insufficient models, affordability, high carbon footprint in production, and insufficient demand due to non-desirable product characteristic or customer concerns. Presently all are applicable. CAEVs position themselves as a progressive addition, targeting underserved and bespoke markets, but also as an alternative, challenging the status quo. This is enabled via CAEV's environmentally conscious manufacturing and matching products to customer desires across all markets – consumer, commercial, recreational, and industrial.

Our claim to add decarbonisation value is best understood by addressing firstly the production challenges in the industry, which we do in 1.1 Centralised production - battery electric vehicles, and 1.2 Regional production - compressed air electric vehicles

## 2. Electrifying the Transport Industry

Electrification is a means to an end – not the end. The end is decarbonisation. In section 1 we addressed the production challenges re decarbonisation. In section 2 we address the electrification challenges with regards to supply of models, demand and take-up, and the implications for the transport industry 2030 climate targets. A natural observation of the transition, especially in its immature stage, is shortcuts – incremental versus transformative change. To make a cryptic comment: to take a consumer luxury superfast, very heavy, very large, vehicle and put a battery in it to do 450 kilometres after 30 mins fill is not a strategy for climate change abatement. Whether a Hummer, a Ram, or a Cyberbeast, we unashamedly do not target this market.

CAEVs, with their innovative micro-manufacturing approach and diverse market coverage, emerge as a sustainable and versatile addition to give niche markets across consumers, commercial, recreational and industrial what they want. We address this in 2.1 Narrow markets – battery electric vehicles, and in 2.2 Diversified markets - compressed air electric vehicles.

## 3. Manufacturing Regionally for Niche Markets

Having shared our views of the auto industry and the opportunities this provides for CAEVs, in this third section we introduce the production of CAEVs as a holistic solution, emphasising sustainable manufacturing practices matched to a comprehensive market coverage strategy. From reduced resource dependency to tailored solutions for various market segments, CAEVs showcase a commitment to addressing both environmental and market challenges. We delve into the ground-breaking manufacturing of CAEVs, emphasising decentralised, regional micro-manufacturing. On the other side we address matching the market needs and desires to the production capability. We cover the manufacture in 3.1 Manufacturing regionally, and the markets in 3.2 Neglected and bespoke markets.

## 4. Creating Australasian Renewables Powerhouse

Australia was blessed with fossil fuel resources which, with evolving global climate targets, lose their significance. Many industry leaders and politicians speak of next becoming a renewables powerhouse. Fantastic, but the dialogue is all based on energy generation. Pumped hydro, hydrogen, solar, wind, and so forth. There is little mention of innovation in core areas like energy storage or transport – instead it's largely what we can create via spending rather than innovation. Investing capital is great, however so is innovation!

We observe little in the areas of pure technological innovation making its way to mass commercialisation in the critical areas of energy storage and transport. Currently as a country, we are accepting what's on offer as a user rather than a supplier, hence joining the global supply chain. That is not our business strategy.

We seek regional economic and security creation through innovation, leading not just following. Focussing on Australasian innovation via CAEV manufacturing and neglected and bespoke market take-up, we envisage Australasia can become known to the world as a market leader for innovation, at least in this area. We address this in 4.1 Adding transport manufacture for global recognition, and in 4.2 The economics, timelines, and relationships initiatives targeting collaboration between ourselves as the innovator and industry as the facilitator.

## Addendum - MDI CAEV Technology

In the Addendum we provide the background to the technology under three headings.

- Compressed Air Electric Vehicle (CAEV) Technology
- Frequently Asked Questions (FAQ)
- Brochure Availability References



# AIR FUTURE →

Following a lengthy collaboration with the likes of Tata Motors, Veolia, KLM Airlines, and World Expo, moving to the Modul'Air design for multipurpose commercial applications was a speedy and affordable project.

## 1. DECARBONISING VEHICLE PRODUCTION

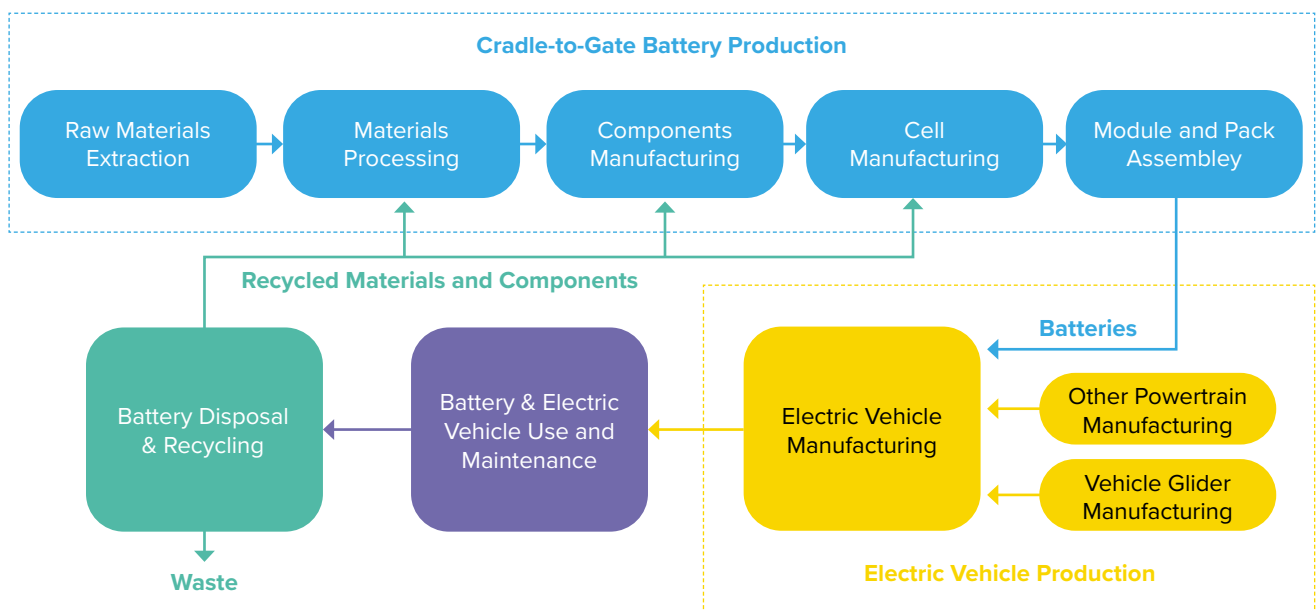
The global shift towards sustainable transportation has predominantly centred around Battery Electric Vehicles (BEVs). While BEVs contribute significantly to reducing emissions during operation, their life cycle approach, particularly in procurement and production, raises environmental concerns. In contrast, our Compressed air electric vehicles (CAEVs) present a promising alternative with a cleaner life cycle.

## 1.1 Centralised production – battery electric vehicles

The so called life cycle assessment (LCA) addresses a technology or product from its first inception to its final breath and disposal or recycle with regards to the carbon generated. For BEVs a schematic of that is shown below.

There are various observations one can make about the Battery & BEV production and life cycle assessment.

### CRADLE-TO-GRAVE LIFE CYCLE OF BATTERIES AND ELECTRIC VEHICLES



- Mining Impact:** BEV production relies heavily on the extraction of minerals like lithium, cobalt, and nickel, leading to ecological disruptions and environmental degradation in mining regions. The long-term consequences of increased mining activities for battery materials remain a concern, with potential negative impacts on biodiversity and local communities.
- Batteries Impact:** BEVs rely heavily on lithium-ion batteries, participating in their extraction, transportation, and disposal, even before the downstream production of the BEVs themselves. The centralised manufacture of batteries often involves extensive supply chain networks, resulting in increased transportation-related emissions.
- Recycling Challenges:** The recycling of lithium-ion batteries poses technical and logistical challenges, with limited infrastructure for efficient and environmentally friendly disposal. The lack of standardised recycling processes and the potential for hazardous by-products raise questions about the long-term sustainability of BEV recycling practices.
- Uncertain Future:** The rapid growth of both the electric vehicle and renewable energy sectors may lead to an unprecedented demand for batteries. The scalability of battery production raises concerns about the availability of raw materials, increased energy consumption in manufacturing, and the ability to manage end-of-life disposal on a larger scale.
- Supply Chain Risks:** Centralised production introduces vulnerabilities in the supply chain, with potential disruptions affecting the availability and cost of critical components, equally affecting BEVs. This could aggravate a product and model supply constraint in the future.

#### Conclusion

Those carrying the climate responsibility mantle should be mindful of the multifaceted challenges associated with centralised BEV production. These emphasise the opportunity for sustainable alternatives like CAEVs that prioritise local manufacturing and counter the potential pitfalls we may be facing.



## 1.2 Regional production - compressed air electric vehicles

The transition from centralised Battery Electric Vehicle (BEV) production to decentralised Compressed Air Electric Vehicle (CAEV) manufacturing offers a strategic solution to several challenges associated with embedded carbon and life cycle assessment. CAEVs, by design, circumvent the reliance on batteries and embrace a regional production model, presenting a promising alternative that aligns with the principles of sustainability and efficiency.

- **Localised Manufacturing Advantage:** CAEVs leverage local Australasian manufacture, reducing the carbon footprint associated with global supply chains. By prioritising local production, we minimise transportation-related emissions and support regional economic growth and support local economies.
- **Cleaner Production Processes:** CAEVs adopt innovative production processes that minimise environmental impact, utilising materials with lower embedded carbon and reducing reliance on resource-intensive components. By tapping into local resources and labour, CAEV production contributes to the growth of the regional manufacturing sector while reducing the carbon footprint.
- **Simplified End-of-Life Processes:** Unlike the complex and challenging recycling of lithium-ion batteries, CAEVs simplify end-of-life processes. The materials used in CAEVs are more readily recyclable, contributing to a more sustainable and environmentally friendly disposal system.
- **Local Economic Growth:** Decentralised CAEV production fosters local economic growth by creating jobs, supporting small businesses, and strengthening regional manufacturing capabilities. The regional focus of CAEV manufacturing significantly reduces the carbon footprint associated with transporting components over long distances, aligning with global efforts to combat climate change.

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### Conclusion

Investors considering the shift from centralised BEV production to decentralised CAEV manufacturing can anticipate a more sustainable and environmentally conscious approach. The inherent advantages of CAEVs, including a battery-free design and regional manufacturing, position them as a solution process that contributes to the broader goal of decarbonisation.

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With our modular capability to produce product across all markets, we will focus on the neglected gaps for consumers, with the goal to rapidly contribute to increasing the electrification of transport, and with a far cleaner carbon footprint.



Above and below: AirPod 2.0

## 2. ELECTRIFYING THE TRANSPORT INDUSTRY



The current landscape of electric vehicles (EVs), primarily dominated by Battery Electric Vehicles (BEVs), has witnessed significant strides in reducing carbon emissions. However, this progress is constrained by a notable shortfall in product models, with existing predominantly targeting larger and more expensive vehicle segments amongst consumer sedans and SUVs. This leaves a substantial portion of the transport market unaddressed.

In contrast, our approach with Compressed air electric vehicles (CAEVs) is to offer a broader range of models tailored to diverse market segments, ensuring a comprehensive electrification strategy that caters to the varied needs of a much wider audience.

*“We should be aiming to enable our market to reach 1 million EVs on Australia’s roads by 2027 (approximately 5% of Australia’s passenger and light commercial vehicle fleet) and around 3 million by 2030 (equivalent to approximately 50-60% of all new vehicles purchased being EVs)”.*

## 2.1 Narrow markets – battery electric vehicles

With Australasia as our focus it is helpful to understand the current BEV market here, for which we turn to the Australian Electric Vehicle Council's full year 2022 and half year ending June 2023 reports. The information and quotations following are taken from those.

The following is essential to include in this document as it supports what we have been saying from one of the most creditable sources. Whilst there is also much we can say about regulations and policies and fuel standards and country comparables and so forth, we do not see those as quick fixes as a panacea.

### Ev Statistics From Australian Electric Vehicle Council

#### Extracts Australia - from EVC full year 2022

*"The number one barrier to getting more electric vehicles (EVs) onto Australian roads today is the low supply of EVs to our market".*

*"This .... will require to significantly expand the supply of EVs to Australia..... necessary to ensure EVs make up at least 50-60% of all new vehicles purchased by then" (by 2030).*

#### Extracts Australia - from EVC 6 month July 2023

*"...electric car, van and ute models available in Australia, most of these are only being supplied in small volumes".*

*"While there is strong interest from industry to make the switch to electric heavy vehicles, this transition is being held back by a lack of suitable vehicles".*

*"... priority for 2023 continues to encourage manufacturers to introduce more affordable EV models to the local market".*

*"For Australia to achieve its climate targets, it is expected that more than 50% of all new cars sold in 2030 will need to be EVs". "In order to achieve this, Australia needs to see a significant increase in the supply of EV models".*

## 2.1 Narrow markets – battery electric vehicles continued

### And the statistics

- Australian EVs as percentage of Australia's passenger and light commercial vehicle fleet. (even though has roughly doubled each year since 2020) – is less 0.5%
- Percentage of new cars purchased that are EVs – 2022 3.8%, 6 months to June 2023 8.4%
- The global average of new EVs purchased is currently estimated to have been between 12 to 14% in 2022, with markets like China having been reported to have achieved almost 28% EV sales in 2022.
- The top three selling models in Australia represent 68.1% of the Australian EV market.

Capturing both from these external market comments and our own assessments so far, we would add the following comments.

- **Limited Model Diversity:** BEVs are primarily concentrated on the upmarket sedan and SUV categories, with limiting options for consumers who prefer other vehicle types such as hatchbacks, compact cars, or commercial vehicles.
- **Cost Barriers:** The high production costs associated with BEVs often result in premium pricing, making them less accessible to a significant portion of the market. This exclusivity inhibits mass adoption and limits the overall impact on reducing emissions.
- **Niche Market Capture:** BEVs, by design, capture a niche market segment, primarily appealing to environmentally conscious consumers with higher disposable incomes. This leaves a vast demographic without viable electric alternatives.

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### Conclusion

Our strategy focuses on electrifying the entire transport industry by offering a comprehensive range of CAEV models where justified by demand and profitability. By providing affordable and accessible electric options across various vehicle categories, we aim to make sustainable transportation a reality for a broader demographic, driving positive environmental impact on a global scale.

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## 2.2 Diversified markets - compressed air electric vehicles

The current modus operandi of mainstream legacy manufacturers including BEV manufacturers tends to operate on a supply-driven model, with centralised production catering to global markets. However, this approach often leads to a narrow product offering that may not effectively meet the diverse needs of specific regions, such as Australasia. The limitation in product diversity, compounded by the influence of supply-driven decisions, results in a market landscape dominated by limited models – such as upmarket sedans and SUVs. This may leave smaller more affordable options and light commercial vehicles largely unaddressed.

- **Diverse Model Offerings:** CAEVs are designed to address the diverse needs of the market by offering models across a wide range of vehicle categories, including compact cars, urban mobility solutions, commercial vehicles, and more.
- **Affordability and Accessibility:** Our commitment to efficient production processes and regional manufacturing allows us to offer CAEVs at a more competitive price point, ensuring broader accessibility and overcoming cost barriers associated with traditional EVs.
- **Mass Market Appeal:** By providing electric alternatives for various vehicle segments, CAEVs have the potential to capture a larger market share and accelerate the transition to sustainable transportation on a mass scale.
- **Urban Mobility Solutions:** Compact and agile CAEV models cater to the growing demand for urban mobility solutions, addressing congestion and emissions in city centres.
- **Commercial Applications:** CAEVs designed for commercial use, such as delivery vans and light trucks, contribute to reducing emissions in the logistics and transportation sectors.
- **Customisation for Regional Demands:** Regional manufacturing facilitates the customisation of CAEV models to meet specific market demands, ensuring relevance and competitiveness in diverse geographic locations.
- **Job Creation:** Regional manufacturing of CAEVs contributes to job creation, fostering a skilled workforce and supporting the growth of local economies.

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### Conclusion

In stark contrast to the supply-driven model of BEVs, our demand-driven approach with CAEVs leverages regional manufacturing to cater directly to the unique needs of local markets.

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We can either outsource the manufacturing and assembly, or we can build a dedicated turnkey micro factory as part of regional growth. Attached shows the outsourcing for the AirTrain.

### 3. MANUFACTURING REGIONALLY FOR NICHE MARKETS

Embarking on a path less travelled, our commitment to decentralised manufacturing for Compressed air electric vehicles (CAEVs) represents a courageous leap towards a more sustainable and adaptable future. By steering away from the conventional centralised production model of Battery Electric Vehicles (BEVs), we position ourselves strategically to capture niche markets, initially in Australasia, and then replicate our success in regions worldwide that are similarly underserved. This bold approach not only distinguishes us in the market but also promises substantial economic and environmental rewards for our pioneering actions.

### 3.1 Manufacturing regionally

- **Local Empowerment:** Establishing regional manufacturing plants for CAEVs empowers local economies, creating jobs and fostering skilled labour forces. This approach aligns with the principles of sustainable development, promoting economic growth at a grassroots level.
- **First-Mover Advantage:** By pioneering CAEV manufacturing in Australasia, we gain a first-mover advantage in a region that has seen limited options in the electric vehicle market. This early establishment allows us to build brand recognition and trust among consumers.
- **Job Creation and Local Prosperity:** Regional manufacturing not only creates jobs but contributes to the overall prosperity of local communities. This economic impact extends beyond the manufacturing facility, fostering a positive ripple effect throughout the region.
- **Simplicity and Traction:** Collaborating with established manufacturing partners in joint ventures provides a streamlined and efficient way to initiate regional manufacturing. This approach allows us to focus on selected markets and products, ensuring simplicity in the early stages while gaining valuable traction.
- **Product Flexibility:** Joint venture partnerships enable us to be nimble and flexible in our approach to product development. We can either start with existing CAEV designs or tailor products to meet the specific demands of bespoke markets or individual customers.
- **Leveraging Expertise:** Partnering with experienced manufacturing entities ensures that the production process is seamless and adheres to industry standards. This collaboration leverages the expertise of our joint venture partners while we concentrate on strategic aspects of market entry and brand development.
- **Expanding Markets and Regions:** As we witness success and growth in selected markets, our focus will shift towards introducing proprietary turnkey micro factories. These factories, established through local joint ventures, will allow us to expand into new markets and regions, tapping into the unique characteristics and demands of each location.
- **Supply Chain Security:** Establishing turnkey micro factories in collaboration with local partners enhances supply chain security. By sourcing materials and components locally, we mitigate risks associated with global supply chain disruptions, ensuring a steady and reliable production flow.
- **Supporting Local Businesses:** The local supply chain developed through regional manufacturing creates a positive economic impact by supporting local businesses and suppliers. This network strengthens regional economies and establishes a sustainable ecosystem.

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#### Conclusion

The phased approach of initially outsourcing to joint venture manufacturing partners and later transitioning to proprietary turnkey micro factories is a strategic move towards realising our vision for regional CAEV manufacturing. Beyond the economic benefits, this approach enhances local supply chain security and ensures that our presence in each region aligns with the unique needs of the community. As we embark on this journey, we not only pioneer sustainable transportation but also become catalysts for positive economic transformation in every region we operate. Manufacturing regionally for niche markets requires courage and foresight, but the potential rewards are substantial. By focusing on neglected and bespoke regional markets initially in Australasia, we lay the foundation for a successful export strategy, providing a blueprint for sustainable growth and market leadership. Our commitment to this approach embodies our vision for a future where electric vehicles are not just vehicles but catalysts for positive change in local communities and global sustainability efforts.

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### 3.2 Neglected and bespoke markets

The unique advantage of CAEVs lies in their versatility and adaptability, filling the void left by traditional BEVs that primarily have targeted the higher-end consumer market. Our strategic focus is on addressing neglected and bespoke markets, initially in Australasia and subsequently expanding globally, including the Pacific Islands and South East Asia. By offering a diverse range of CAEV models, we aim to cater to affordable consumer vehicles, light commercial applications, recreational purposes, and customised industrial solutions.

The following are some examples.

- 1. Affordable Consumer Vehicles:** CAEVs are designed to provide affordable and efficient alternatives for daily commuting, especially for shorter distances and urban environments. This addresses the neglected segment of consumers seeking budget-friendly electric options for everyday use and shorter trips, or as a second car.
- 2. Light Commercial Vehicles:** Recognising the demand for sustainable solutions in the commercial sector, CAEVs offer light commercial models suitable for logistics, deliveries, and local transport. The fast refill station capability appeals to commercial users, enhancing efficiency and reducing downtime.
- 3. Recreational Vehicles:** CAEVs cater to the recreational market with models designed for outdoor enthusiasts. Whether it's electric ATVs (all-terrain vehicles) for off-road adventures or compact electric vehicles for exploring natural landscapes, our range can provide sustainable alternatives for recreational activities.
- 4. Customised Industrial Applications:** Beyond traditional consumer markets, CAEVs target bespoke industrial applications. This includes airports for multiple applications, utility vehicles, buses for local councils, and customised solutions for specific industrial needs, showcasing the adaptability of CAEV technology.
- 5. Urban Mobility Solutions:** Compact CAEV models tailored for the future of urban environments, addressing the need for efficient and sustainable transportation in crowded city and suburban centres.
- 6. The future:** Wherever it may lead us, for example car sharing, pizza delivery, autonomous vehicle, and endless other alternatives. This is an area where retrofit can also become viable via local businesses, and last-mile deliveries and local transport needs, providing an eco-friendly alternative for commercial operations.
- 7. Closed Communities:** There are a plethora of communities that use small run around transport.
- 8. Government and Military:** Tailored CAEV models for specific government applications. Unlike traditional mainstream BEV providers, these applications are very diverse.
- 9. Pacific Islands:** Regional areas with specific needs, with greater capability from global climate financing as tabled at UN conference COP 28 in Dubai. What the IPCC calls Justice for All.
- 10. South East Asia:** There is nowhere that the small consumer end of CAVs would have greater and more diverse application. South East Asia, where urbanisation and industrial growth are driving transportation demands, CAEVs offer efficient and sustainable solutions.

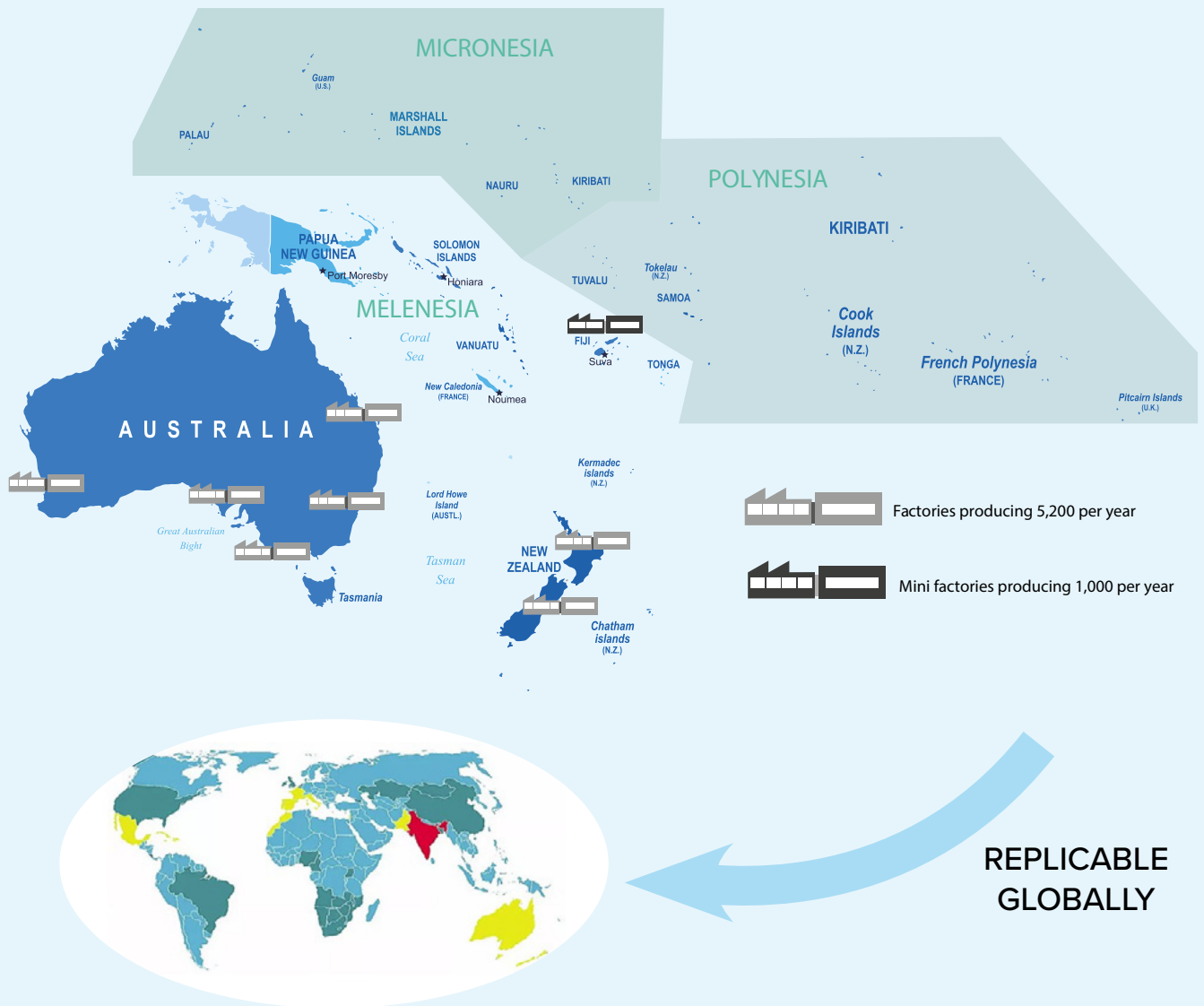
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### Conclusion

Our commitment to addressing neglected and bespoke markets positions CAEVs as pioneers in providing sustainable transportation solutions beyond the conventional consumer market. By focusing on diverse applications in Australasia and expanding globally, we aim to meet the unique needs of consumers and industries alike, fostering a new era of accessibility, efficiency, and sustainability in transportation.

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#### 4. ADDING TO AUSTRALASIAN RENEWABLES POWERHOUSE

Australia stands at a pivotal moment in its economic evolution, transitioning from a fossil fuel export-rich economy to a potential renewables powerhouse. The global shift towards sustainability and the urgent need to combat climate change have positioned Australia as a key player in the renewable energy sector. While much of the current discourse revolves around green hydrogen production and export, there

exists a significant yet untapped opportunity in the transportation sector. By reinvigorating our heritage as a vehicle manufacturer, we can lead the charge in sustainable transportation through the production and export of Compressed air electric vehicles (CAEVs) to a range of underserved and bespoke markets. Commence locally, replicate globally.

## 4.1 Adding transport manufacture for global recognition

- **Green Hydrogen Focus:** Australia's commitment to becoming a renewables powerhouse is evident in the focus on green hydrogen, solar, and wind predominantly. Abundant sunlight and wind resources provide a unique advantage for the large-scale generation of green hydrogen, positioning the country as a global leader in this emerging industry.
- **Economic Transformation:** The transition to renewables represents a once-in-a-lifetime opportunity for Australasia to redefine its economic landscape. By embracing clean energy production, we can diversify our economy, create new jobs, and become a hub for sustainable innovation.
- **Neglected Potential in Transportation:** While the discussions on renewables primarily focus on energy production, there's a notable gap when it comes to the transportation sector. This oversight ignores the significant role transport plays in overall emissions and the transformative potential of sustainable transportation solutions.
- **Comfort zone:** Australia is proud of its billionaires, and we know those created via resources. They were true innovators. But whilst we have billionaire presence in transport, it's not via technological innovation, but via astute commercialisation. Since the halcyon days when we were a manufacturing nation there has been a quiet resignation. Now it's a new beginning and time to get comfort with transport innovation and auto manufacture. That will be our challenge to promote.
- **Exporting Green Transport Solutions:** For those who find the solutions and the country that gets behind them there is a huge market. EVs have happened (are happening) very quickly, and the gaps being left are glaring.
- **Engaging Industrialists in the Vision:** Industrialists and business leaders can play a pivotal role in shaping Australia's transition to a renewables powerhouse regardless of their industry. Engaging with these stakeholders to showcase the economic and environmental benefits of CAEV manufacturing establishes a collaborative framework for success.

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### Conclusion

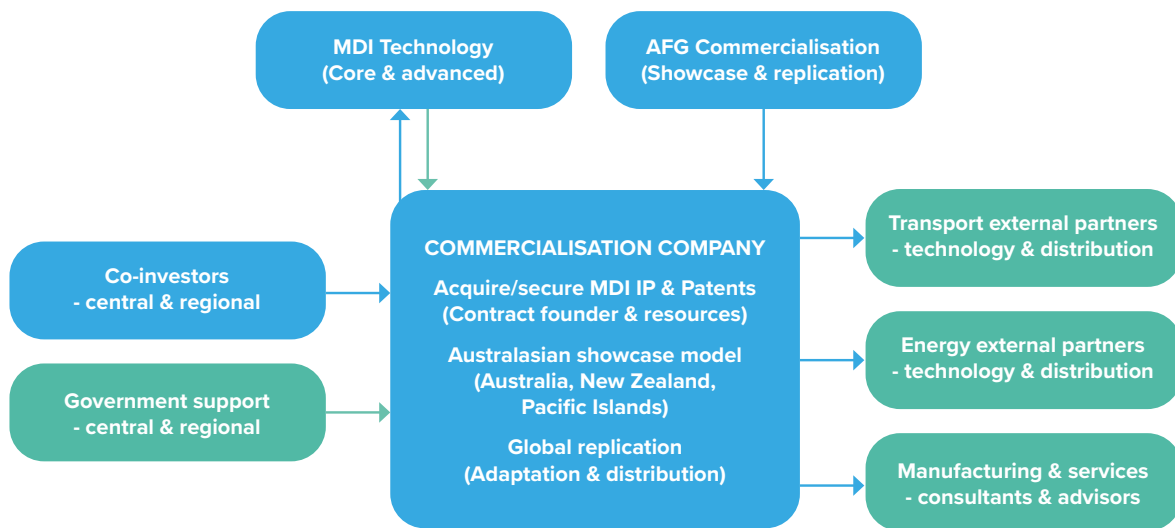
Australia's pursuit of becoming a renewables powerhouse should not neglect the immense potential within the transportation sector. By rekindling our manufacturing legacy with the production and export of CAEVs, we can contribute to a sustainable future, capitalise on global demand for green transport solutions, and secure our position as a leader in the clean energy revolution.

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## 4.2 The economics, timelines, and collaboration initiative

Our Australasian Clean Transport Initiative represents not just a venture into sustainable vehicle manufacturing but a strategic move that transcends regional boundaries. It involves securing channel partners, technical specialists, and collaborators across specific markets and regions in Australasia and beyond.

Our approach focuses on wholesale distribution, recognising the diverse needs of each market and region. Simultaneously, we are embarking on a multi-level funding strategy to support our endeavours, encompassing working capital, project and joint venture funding, manufacturing support, and securing cornerstone investments.



Collaborating and enabling transport modernisation solutions via market partners

### Executive team

The platform's initial executive team consist of the AFG Chairman and CEO and the MDI President. The following are those executive's details.



**RUSSELL FITTS**  
Chairman

Russell has been executive chairman of all companies since incorporation. He has led the incubating company through its various progressions to position it with the operating group and exclusive licence rights for all of Australasia. His personal relationship with the licensor and his global network of contacts has laid the foundation for growth via commercialisation. His prior experience in farming and business earned respect by contributing as a Senior Member of the NZ Property Institute and servicing the NZ Earthquake Commission.



**JOHN MENNEGA**  
Group CEO

John has an MBA, BE(Elect Eng), Grad Dip (Industrial Eng), and Grad Dip (Applied Finance & Investment). His background spans engineering, finance, investment banking, and management with significant experience in early-stage business roll-out & growth. He has held top level executive roles in major Australian listed companies before devoting his experience to advising both middle and smaller companies on achieving financial & operating goals.



**DR CYRIL NÈGRE**  
MDI President

Cyril is the President of MDI and Director of MDI R & D. He holds a PhD in Mechanical Engineering, and began his career in Bugatti Automobile car design, joining his family's company MDI in 1993. Cyril is AFG's key contact within MDI and organises and coordinates the support of their team. AFG's Director level strong personal relationship and investment with MDI goes back to Cyril's deceased father and founder Guy, and then closely with Cyril.

Team to be built across markets via recruitment and partners

## 4.2 The economics, timelines, and collaboration initiative continued

The relationship structure involves the following.

- **Channel Partners:** Collaborating with channel partners specialised in distinct product markets allows us to tailor our offerings to specific consumer needs. This includes partnerships with entities experienced in urban mobility, light commercial, recreational vehicles, and customised industrial solutions.
- **Technical Specialists:** Engaging technical specialists in bespoke markets ensures that our CAEVs meet the unique requirements of each industry or large bespoke customer. For example, partnering with specialists in airport logistics, municipal transportation, or recreational vehicle design enhances the functionality and relevance of our offerings.
- **Regional Collaborations:** Forming collaborations within discrete regions across Australasia enables us to understand and address the specific demands of each market. By working closely with local businesses, governments, and communities, we ensure that our CAEVs seamlessly integrate with regional lifestyles and infrastructure. We also see progressive regional funding sourced in regions.
- **Wholesale Distribution:** Our choice of a wholesale distribution model over proprietary allows us to adapt to the diverse markets and regions we address. This approach fosters flexibility in product offerings and pricing strategies, ensuring alignment with the unique characteristics of each locale.
- **Scalability and Diversity:** Wholesale distribution enhances scalability, enabling us to efficiently reach a broader customer base. This model not only facilitates widespread market penetration but also enhances accessibility to our sustainable transportation solutions.
- **Working Capital:** Initial funding focuses on securing working capital to support day-to-day operations, covering manufacturing costs, distribution, and marketing expenses as we establish and expand our regional manufacturing hubs.
- **Project and Joint Venture Funding:** Funding for specific projects and joint ventures ensures the successful execution of collaborative initiatives. This includes the development of new CAEV models, customisation for bespoke markets, and joint ventures with regional partners.
- **Manufacturing Support:** Funding directed towards outsourcing at the early stage and purpose factories for regional growth can be funded in innovative ways.
- **Cornerstone Investments:** Securing cornerstone investments from various levels, including central corporate and regional stakeholders, is essential for long-term growth and stability. This funding source serves as a solid foundation for sustained development and expansion.
- **Production profitability:** Models have demonstrated favourable net profit margins from relatively low production volumes per factory – relevant as one factory can generate different products. The immediate intention currently underway is to update projects in conjunction with local manufacturers.
- **Asset Creation:** Once factories are included regionally they become a joint venture asset, contributing to the economic and industrial development of the local communities. This asset creation ensures a sustainable and lasting impact on the regions we operate in.
- **CAEV Innovation Fund:** To further drive penetration into new regions and support climate-impacted areas, we propose to establish a CAEV Innovation Fund. This fund will be dedicated to facilitating entry into new regions. An example of the proposed funding initiative is the “Justice for All” IPCC and COP programs, directing resources towards regions most impacted by climate change, and contribute to a more equitable distribution of clean transportation solutions.

## 4.2 The economics, timelines, and collaboration initiative continued

**Conclusion:** Our Australasian Clean Transport Initiative goes beyond being a regional endeavour. It seeks to position Australasia as a global leader in non-battery sustainable mass transportation. By addressing immediate and long-term needs, fostering economic viability, and creating assets within each region, we set the stage for a future where clean vehicles and innovative energy solutions are accessible to all. The proposed CAEV Innovation Fund represents an initiative using compressed air technology for continuous improvement, innovation, and a climate-conscious approach that leaves no community behind.

Through these future opportunities, we embark on a journey towards a cleaner, more sustainable, and equitable world. The establishment of the Australasian Manufacturing Hub for Niche Transport Markets is a strategic step in commercialisation. By forging partnerships, embracing a wholesale distribution model, and implementing a diverse funding strategy, we position ourselves for success in regional manufacturing, market capture, and global expansion.



Above: United Nations award to MDI entitled “Powering The Future We Want”.

## ADDENDUM - MDI CAEV TECHNOLOGY

- A1. Compressed Air Electric Vehicle (CAEV) Technology
- A2. Frequently Asked Questions (FAQ)
- A3. Brochures Availability References

### A1. TECHNOLOGY

There are five core platforms to the MDI CAEV technology, and all of them have modularity as a key differentiation. That has huge significance for our transport market vehicles and their manufacture.

- 1. System modularity:** The vehicles are powered by the unique and patented MDI Micro Compressed Air Energy Storage and Thermal Energy Storage System (mCAES/TES). Can refer also to Energy Document.
- 2. Components modularity:** Components making up the mCAES/TES, the manufacturing, and the CAEV construction are all modular. This enable multiple applications and designs at very low marginal cost.
- 3. Construction modularity:** CAEVs are uniquely designed and constructed, especially with a focus on light weight and efficiency.
- 4. Manufacturing modularity:** The turnkey (predesigned and replicated) distributed manufacture is a revolutionary technological innovation enabling regional approach to markets, and climate goals.
- 5. Refill modularity:** The CAEVs can be refilled in multiple ways, one being using our Fast Refilling Stations in a matter of a few minutes. More driving, less waiting. Modularity of the systems also enables various range designs, and we anticipate adapting to the existing charging networks as an option.



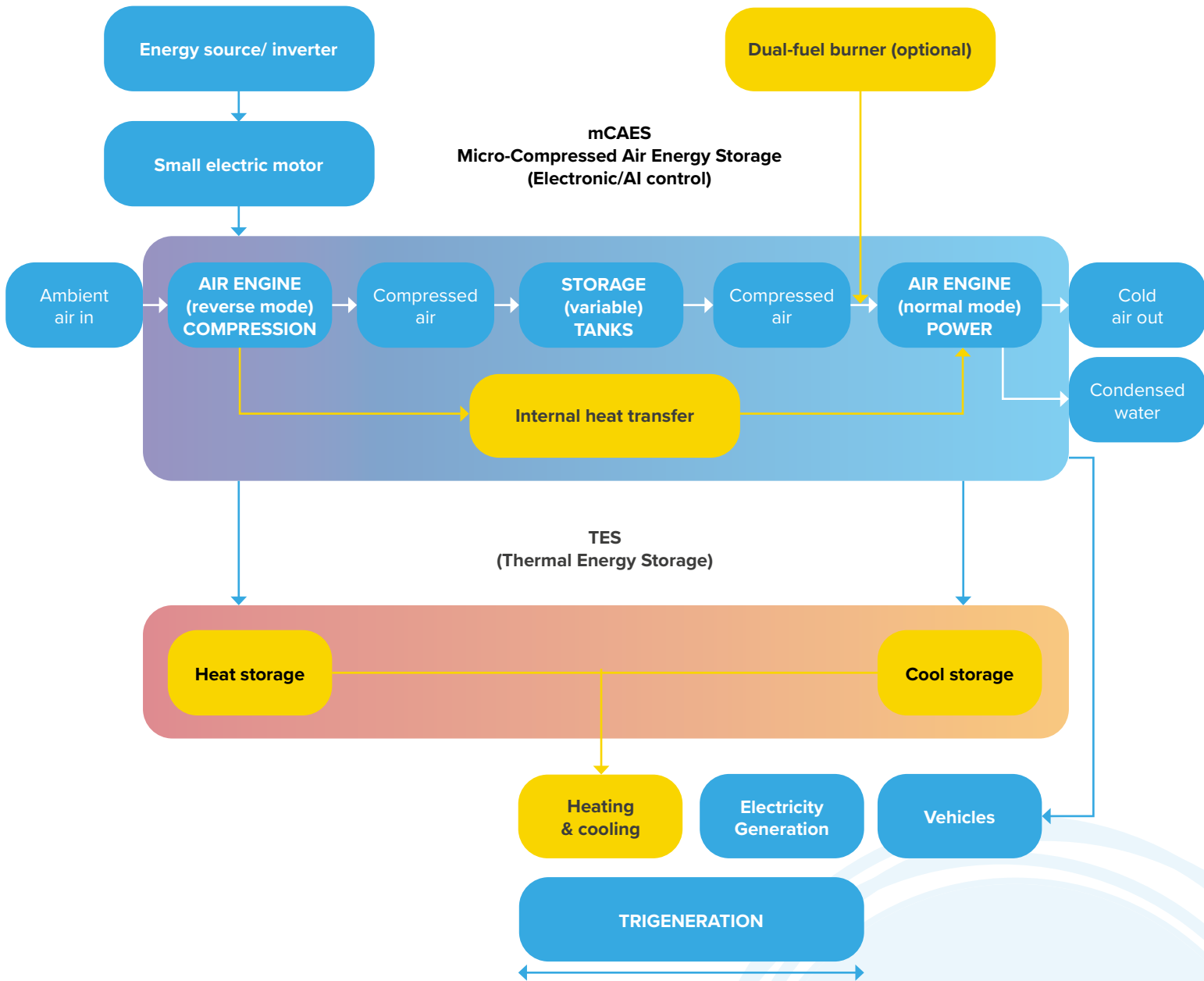
Chairman Russell Fitts at the wheel of the later CAEV development model AirPod 2.0



CEO John Mennega driving early CAEV on MDI test track in France

### Technology 1: System Modularity (mCAES/TES)

The core energy storage, electricity generation, and vehicle driving system is the mCAES/TES system seen schematically below.



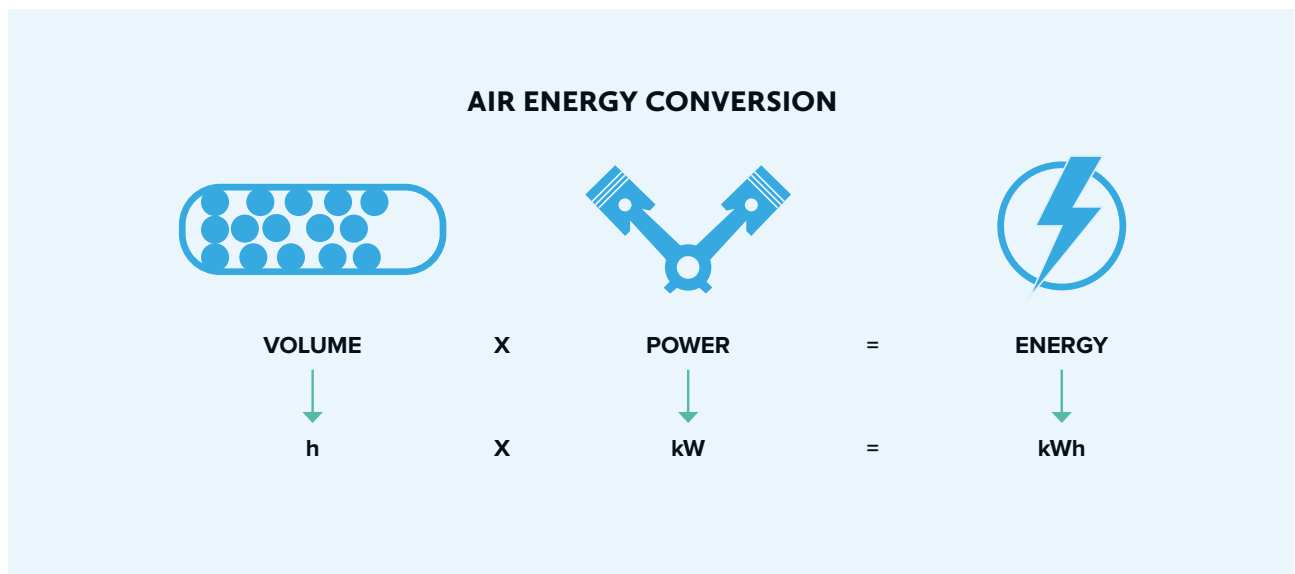
The above diagram's upper blue section shows the flow commencing on the left side with electricity generation (e.g. solar) running a small electric motor (for plug in only) that runs the air engine in compression mode and stores the compressed air in the tanks. On demand the compressed air is released and it drives the air engine which runs a generator and produces electricity or drives a vehicle.

The diagram's lower yellow section shows the parallel thermal optimisation via capturing the heat on compression and the cooling on expansion. The application of heat either from the compression or externally can significantly increase the duration and range. With electricity, heating and cooling applied for customers, the system becomes trigenation (all three).

### Technology 1: System Modularity (mCAES/TES) continued

Micro compressed air energy storage (mCAES) electrification uses air energy (not chemicals) to generate electricity or power a vehicle. Thermal energy storage (TES) manages thermal optimisation, with options such as application of a low temperature heat at expansion (such as a biofuel) to triple the

capacity, or capture the heat and the cooling to apply within the system or externally. When mCAES/TES combine the system becomes a trigeneration one (electricity, heating and cooling). This has many construction implications for manufacture and markets



Above: Unlike nearly all other storage systems, mCAES can separate (decouple) the power (kW) from the hours (air storage) making the energy supply (kWh) modular.

*Below we see the trigeneration in action, all from the same mCAES/TES system. With its inbuilt modularity above the diversity and scope for both energy and transport applications is huge.*

### ONE SINGULAR TECHNOLOGY, FOUR APPLICATIONS



**SINGULAR TECHNOLOGY & SYSTEM** → **FOUR APPLICATIONS**

A unique multi-application from a single energy generation & storage service. The future is bright and comfortable



## Technology 2: Components modularity

**The Reversible Air Engine.** A patented and innovative component, functioning both as an air compressor and an air expander, serving as the core of the energy storage and conversion system. The engine's modularity, variable sizing, racking, and variable operational modes determine the system's capacity – which can be dynamic and AI/software controlled. Engines can match energy capacity (kW power) and duration (kWh energy). The choice between standardisation and modularity enables adaptation to the diverse market conditions.

**Smart Piston Operation.** Modular piston management is a core aspect of the system. Beyond piston variability, pistons are managed through a smart electropneumatic valve train, resulting in smart cylinders. This approach allows for variations in the adiabatic and polytropic operation, optimising efficiency and enabling a wider range of applications. The smart electropneumatic valve train enables an extreme flexibility that makes a single engine applicable to various products. The rev-by-rev management of the engine, that ensures the adaptability of its performance, is a key point when connected to renewable energies. Despite these adjustments, the engine design is based on a conventional piston engine. The efficiency and power required to operate the converter as a compressor can be electronically modulated on a per-revolution basis.



2 Cylinder engine



3 Cylinder engine

*The modularity which has been emphasised throughout can be further seen by the numerous laboratories all focusing on elements that can be varied and brought together to service multiple applications.*

The air engine lab



The composite materials lab



The storage lab



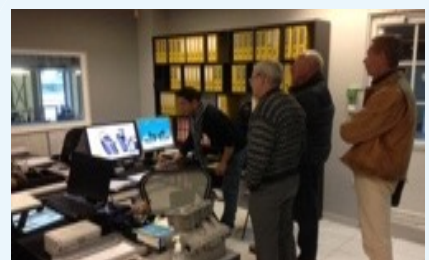
The premises solar lab



Biofuel external burner



The markets team



Specialised laboratories were deployed across all the mCAES innovations

## Technology 2: Components modularity continued

**Modular Storage Tanks.** Tanks offer the flexibility to be larger or smaller, added separately, operated in serial or parallel configurations, or any combination thereof. Tanks can also be placed underground for larger refilling stations. A small system may operate at a pressure of 248 bar. Carbon fibre tanks have an estimated lifespan of 20,000 cycles, equivalent to 20 - 30 years of usage. Their recycling process poses no chemical or physical issues. Carbon fibre tanks are subject to a filling test every 5 years and are appropriately certified, including the ability to withstand vehicle accidents without fragmentation. Importantly, there is no discharge or degradation; when the system is not in use, it remains 100% charged. The system is safe for use in inflammable environments, requires low maintenance, and is highly robust, capable of operating in various conditions, including remote locations. The software- controlled system is resistant to theft, making it suitable for remote and potentially vulnerable areas.

## Technology 3: Construction modularity

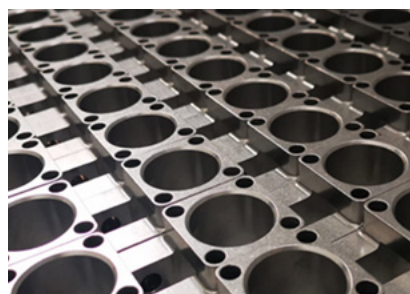


Manufacture is unique, and ideally suited to the Australasian showcase and global and regional replication, via either outsourcing or turnkey purpose built factories. As the components and construction and the factories are modular, the shift in construction from smaller recreational vehicles, to middle sized consumer vehicles, to larger commercial and industrial vehicles, can be achieved quickly and affordably, without the carbon footprint.

Building an Australasian automotive manufacturing industry without future reliance on uncertain supply chains.



Body panels



Carbon fibre tanks



Engine assembly



Electronic parts



Assembled engines



GreenAir for Expo

### Technology 4: Manufacturing modularity

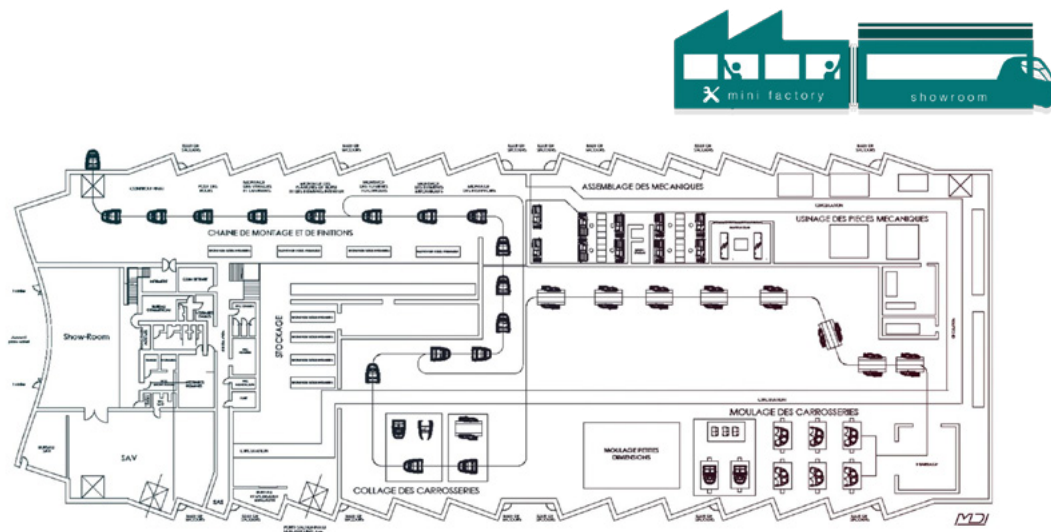
**Manufacturing & factory modularity:** The production process for mCAES components is highly modular, both at the component level and the production level. This modularity allows for standardised components to be manufactured and assembled with ease.

**Scalability:** Manufacturing and assembly can be scaled progressively, from small-scale production to large volumes. This adaptability allows mCAES to meet market demands effectively and expand production as needed.

**Turnkey Manufacturing:** Manufacturing and assembly are turnkey processes, which means that all the necessary plans and designs are available for immediate implementation. This approach streamlines the manufacturing process, ensuring efficiency and consistency.



Above: Early development factory on open day



Above: Factory layout

*Our mass commercialisation is a business model based on regional manufacturing and partnerships across manufacture, distribution, and field technology applications. That is contrary to the prior research and development stage business model which had a centralised laboratory factory. The picture shows an open day at the factory.*

*When we talk of turnkey we refer to completion of plans and processes, construction and operation. The schematic below shows the earlier manufacturing plan for the AirPod 1.0 (current model 2.0). Modern plans will be based on the modularity of the factory construction or the outsourcing partnership. For example transport and energy can be addressed in the same manufacturing environment if so chosen.*

**Technology 5: Refill modularity**



One thing that no other technology is suited to do is to fill from themselves to themselves. But air is ideally suited to do that. And super fast. In keeping with our modularity platform, Air Refill Stations as seen here can come in many purpose build capacities – and even be mobile themselves. Refill can also be via plug into electricity, and we will be progressing the connector and voltage management to connect to the national EV recharging network.



## A2: TEN FREQUENTLY ASKED QUESTIONS

### **Q1** Whilst modularity can cater to different markets, doesn't it create a large overhead.

To the contrary it enables the technology and the manufacture to achieve what it does. The differences if one compared to mainstream mega factories are that modularity was the theme from the very start, the product design and construction is suited to it, and of course the regions and markets are as well.

### **Q2** Why are CAEVs inherently more affordable than BEVs?

BEV mainstream manufacturers have huge capital expenditure, overhead and logistical costs. Price is to some extent also determined by competitors, and transitioning from ICE to BEV vehicles is very expensive. Batteries add a huge cost, especially with oversized and over capacity vehicles. For CAEVs the manufacture is much simpler and the huge procurement costs are not there, and we don't have the product logistics. As an aside we focus on recyclable materials, without toxic waste, contributing to a circular economy.

### **Q3** Why is the efficiency and energy density not advantageous for the markets we are addressing?

All characteristics of a technology are relevant to some extent, but they vary across applications. For example efficiency, energy density, weight, performance, pricing, range, supply availability, and so forth. So comparing batteries with hydrogen fuel cells will show each to have advantages and disadvantages. Now what's nearly always overlooked is that the characteristic of the components may not reflect the same into the overall system to the eventual product to the eventual real world application. For example a heavy, large, overcapacity product's performance may not reflect the characteristics of its components.

### **Q4** How and when can investors expect returns, and what are the key milestones?

The key milestones will depend on the investment structure, as working capital, project funding, or cornerstone investors might have different funder relationships. But keeping it simple, there is the manufacturing establishment, initially sped up via outsourcing. In parallel markets and channels will be established, possibly using a demonstration model. Also in parallel will be established the channel and technical partners, as well as the cornerstone investment. Some of this might be replicated in other regions. These are the key milestones and from day 1 funding we project earnings 12 – 24 months and increasing from there. If earnings are for profitability remember it took Tesla 17 years to profit, but everyone became wealthy meantime. The topic then becomes creating liquidity.

### **Q5** Are you taking into account battery innovation and improving battery technology and prices?

Let me firstly claim that the medium to long term future of batteries is highly uncertain, and will be subject to supply and demand as well as production processes and new technology. Batteries prices are uncertain long term as the world electrifies. And battery prices may not synchronise with BEV prices. The world's demand for batteries with global electrification could increase by 300%. New technology could improve Li Ion batteries or replace them (in both cases making obsolescence). Recycling could become regulated and expensive. And our technology and price, like everyone else's, will likely evolve as well.

## A2: TEN FREQUENTLY ASKED QUESTIONS CONTINUED

**Q6 Don't legacy mainstream manufacturers benefit from centralised economies of scale?**

Legacy manufacture firstly needs economies of scale in production, which then needs validation via sales volume. So it's a two edged sword, and the impact of that can be seen right now during the electrification transition. The result is conservatism, whether in models or in what regions to send them to. Even right hand versus left hand becomes a consideration. Even prior to Tesla the automotive manufacturers weren't in high heaven. So this necessity in part creates the present model and supply issue. Our whole process across technology, procurement, production and markets is different.

**Q7 With an increasing variation of EV models coming online isn't proprietary distribution better?**

Even for few markets proprietary distribution is a huge overhead (We are not talking about a showroom or online, both which we will do). So when China BYD move in its via partnerships. In our case it is much more pronounced. We target multiple markets and they may all have different sales & service channels, targeted at markets rather than products. This applies to all of consumers (though less so), recreation, closed communities, commercial, industrial and government and military (all markets we service).



CAEV buses can easily be modular and not be so expensive.

**Q8 Will CAEVs lack the established infrastructure for charging networks which benefit BEVs?**

CAEVs have multiple refilling options including the extremely fast air refill, plus also the electrical plug in charging. Charging networks have various speed options, and we will be looking to plug into them as another option. That will require agreement with the various owners, pug connection, and voltage management, mainly for fast chargers.

**Q9 CAEVs may be priced for markets, but will they match the performance of electric vehicles?**

If performance is measured in speed and acceleration, it's not inherently a battery that creates the performance but its capacity in line with the other features, many of them negative (e.g. weight). We will not specifically seek, nor will we judge performance by these characteristics. Unless our markets require it, and then we can go down the same route.

**Q10 What happens if CAEVs fail to gain traction? Will my investment or ownership be secure?**

We will aim to address items of warrantee and service prior to market entry. Insurance will be an integral part of that. Don't think of us as too different to anyone else. In a revolutionary environment such as climate change there will be, and needs to be, innovation.



Australian AFG & European MDI in France planning the Australasian showcase.