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Submission By Air Future Ltd & Air Future Group Pty Ltd

To

Climate Change Commission – 31 January Draft Advice for Consultation

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THIS SUBMISSION

1. **Executive Summary – Who we are.**

Air Future Limited -(AFL) is a New Zealand unlisted public company commercialising the MDI compressed air technology with their affordable clean vehicles and scalable distributed energy storage products. AFL's subsidiary operating company's arms for transport and energy hold exclusive MDI licence rights for all of Australasia (Australia, New Zealand, and the Pacific Islands).

MDI - Technology: Motor Development International's (MDI's) research and development facilities are in France. Their corporate headquarters are in Luxembourg. MDI are the developers of patented compressed air clean vehicles and distributed compressed air energy storage. Manufacture is via regionally distributed turnkey micro factories. Their industrialisation partners include Tata Motors in India who have acquired the Indian licence for all MDI products, Veolia who commissioned the clean waste vehicle the AirBom, plus numerous others including KLM Airlines. MDI were honoured by the United Nations with an award in the sustainable transportation at the "Powering the Future We Want" program in 2016.

Partnership - AFL/MDI: AFL is one of the longest standing and trusted partners of MDI and has specific responsibility for Australasia. MDI do not commercialise themselves as their focus is only on research and development and industrialisation. They have developed the distributed manufacturing model enabled by the technology, and Air Future may undertake in conjunction with MDI further global license rollout.

2. **Climate Change Commission - Objectives**

"To guide Aotearoa to change in ways that will help address the global problem of climate change.

To provide independent, evidence-based advice to government on climate issues.

..... advice is based on research and analysis of different factors that can affect our emissions and the potential impacts and effects of climate change. It helps the government make decisions to help transition to a thriving climate resilient and low-emissions Aotearoa."

3. This Submission

This submission focuses on the above and the following objectives:

The Climate Change Commission objectives to ‘research, analyse and inform’ together with Air Future Ltd’s objectives to commercialise (manufacture, distribute and sell) the MDI transport, energy and energy storage technology.

Between the costly and inefficient hydrogen technology being promoted for heavy transportⁱ, and the increasing concern over the mining of the raw materials and the recycling of electric batteries required for transport and energy storageⁱⁱ, coupled with the with the hidden carbon footprint of current electric vehicle manufacturing and distribution processesⁱⁱⁱ, there is a huge gap.

In this submission we introduce Air Future and the MDI technology to the Commission.

We also wish to highlight that the considerable gap (where most consumers lie) between the restricted and expensive applications of hydrogen technology and existing lithium ion battery E.V’s can be affordably filled with not a future technology but with one that is available now.

This same technology has important applications for distributed electricity generation and energy storage, and Air Future is focused on introducing it to New Zealand.

OUR PRODUCTS

4. The Technolgy - *Compressed air advantages*

MDI have adopted from the start a holistic approach to both the technology design and its incorporation into vehicle and energy products. The results from that approach can now be seen in cleaner products, in their manufacture and in their operating conditions.

MDI’s advantages can be seen at four levels: the breadth of the technology, the current products for commercialisation, the distributed local manufacture and the development opportunities to complete a full range of new products or retrofit markets.

The core of the MDI energy storage and generation system consists of a uniquely designed compressed air engine along with the functions providing compression, storage, expansion, and drive power or electricity generation. Storage is flexible, and hence scalable, via carbon fibre or

steel storage tanks. The storage cycle can be powered by electricity (just like charging a traditional battery) or by a solar or another renewable source, or via an MDI mini refilling station taking just a few minutes. This storage system could be envisaged as a 'compressed air battery'.

MDI has adopted lightweight composite materials in its product manufacture. Vehicles are lightweight and strong, with many functions integrated into the bodywork adding efficiencies. MDI product production is ideally suited to smaller distributed manufacturing, benefiting regions via small cleaner local factories, employment and control over their own energy destiny. For communities or remote micro grids energy storage can be aggregated and positioned in a dedicated area or placed underground.

Engines can be larger or smaller and can be optioned to also be operated with dual energy via an external lower temperature burner, providing triple the range benefits. Storage tanks can be larger or smaller and added separately. The dual energy option requires just 0.5 litres per 100km and generates virtually zero amounts of dangerous nitrogen oxide emissions and unburned hydrocarbons. MDI engines achieve efficiencies of more than 68% between the tank and the engine outlet.

Engines' storage capacities are over various ranges with capacity from below 7kW to 21kW to over 60kW initially. Tanks vary in size storing air at 248 bar. The energy storage systems are predicated on being modular and flexible. So scale can be achieved via larger engines, more tanks, or adding more solar panels (or wind). Hence the capacity in kW or the energy used in kWh can be managed separately. In most other storage devices they are fixed. Carbon fibre tanks have an estimated life span of 20,000 cycles, which is equivalent to a life of more than 50 years and exceeding or matching a vehicle life.

5. Vehicles & Energy Products

Transport

Whilst the above technology is at the core of products and applications, MDI has designed such applications holistically from the ground up. For example vehicles use composite materials like those used in exotic cars, light weight, integrated design of all componentry and wiring and most critically, low manufacturing cost.

The design of production is so innovative that MDI vehicles can be produced very economically by smaller distributed factories. No more huge capital outlay, huge land, and risky break-even volume. Plus a variable factory production model suited to any stage of a market's development. And you can both expand and contract. And you can do so in the same location or different. Employment and resources are local, whilst still accessing centralised supply and overseas componentry for around 20%, but only when justified.

The vehicle range is progressive, spanning from small to very large. At the small end is the GreenAir golf cart and the AirPod, and small commercial and consumer options of them both. The AirPod is certified for on road in Europe as a quadracycle category L7e, and is available everywhere commercially off road. We hope New Zealand will consider similar categorisation to Europe. Next we have the larger more standard vehicles being the AirOne and AirCity. We also have a mobile waste collection vehicle, currently certified by Veolia in France.

Thereafter MDI is progressing a continuing range of vehicles and transport, from family to commercial to industrial, farming to marine. Other applications are innumerable; an early example is street lighting. In all cases completely emission free, affordable, and scalable.

Electricity Production

Many pundits in renewable energy propose that whilst renewable energy in transport is big, in electricity it will be huge. MDI energy storage and electricity generation systems have application ranging completely across the spectrum - from centralised to distributed. That means from consumer to commercial to industrial, including utility. Home energy is our first focus along with stand alone generation.

MDI energy systems work extremely well with all forms of energy. So solar and wind are obvious examples, with solar in homes and remote initially on the forefront of consumers minds. But MDI systems can also work with biomass or other energy systems due to the different heat design. Heat and air work well together thermodynamically. For some of us we see a dream of providing affordable energy to remote locations, requiring negligible maintenance. With energy efficiencies, price, and system independence this is not a hollow dream.

Energy Storage

Renewable energy generation is based on nature. Nature is intermittent. Therefore it is inefficient. To overcome this one needs storage. Energy storage is very hard to do. Traditional storage is very capital expensive, or very operationally unaffordable, or not particularly clean or has disposal, duration, or risk elements. There is often lack of modularity or scale. So hydro and nuclear, are mass examples. And batteries are non mass examples.

The renewable energy generation is becoming more efficient by the day. But not so storage. The pace is changing slowly. Historically batteries for example have improved slowly technologically. Raw material supply is also a risk. Disposal is a hazard. They can be a fire risk. Not clean to produce. And they are relying on mass production scale for economics, which is not a sound economic parameter.

Simply put, the MDI storage technology has none of these inhibitors. It is affordable. The technology is modular and scalable, and the manufacture is also modular and scalable. It is clean to produce. Does not have the duration or disposal issues. It has far broader and more pervasive

applications. The differentiations are innumerable. It is a next stage technological commercialisation.

Of course in these cases by definition the mass industry is yet to become familiar as traction is gained and publicity takes off. That has started, with some of the largest corporations and countries moving to adoption. For New Zealand to do likewise on their behalf requires no costs, no individual subsidies, and no risks; but much upside.

6. Local Manufacture

Decentralisation. The advantages from the technology in being distributed micro manufacturing suit communities plus are practical. Traditional mammoth central manufacturing adds a huge load to the climate and pollution footprint. To distribute their goods globally requires storage, shipping, and delivery around the world. This can be said of utility electricity as well as goods via transmission. Purchasing an electric vehicle with a battery masks the production complexity from raw materials, supply chains, delivery and disposal. As seen in the pandemic there is the risk that battles exist for product supply. Air Future global volume purchase discounts can still be coordinated.

Factories. MDI turnkey distributed vehicle factories require just 4,500 square metres with land requirement 15,000 square metres. Additionally significant synergies and economies can be achieved by integrating vehicle and energy production. For example AirPod maximum production per annum with one 8-hour daily shift is approximately 5,300 for vehicles and 15,000 for energy storage units. The factories can be run on a modular basis with a low break-even annual production volume estimated at 400-500 vehicles. Employment based on production capacity is 36 for 1,000 vehicles per annum (single shift), 56 for 2,000 (same capacity, double shift), and 81 for 5,300 (full capacity).

7. Vehicle refilling Stations

The storage cycle can be powered by electricity to the reversible engine (just like plug-in charging a traditional electric battery) or by a solar or another renewable source, or via an MDI mini refilling station taking just a few minutes.

Refill Stations. These micro units are intended to be located in the most accessible and convenient points, or they can be mobile as no connection to power is required. It is intended to have a network of refill stations. With this facility, combined with the alternative of plugging into a conventional electric plug, or having dual energy mode, the emphasis is on range and ease of use.

8. Summary - Our Expectations and Support

This submission, under the invitation from the Climate Change Commission, serves only as an introduction. We hope it will enable us to have an active engagement to further the Commission's understanding of our capabilities, and to further ours in how we might assist the Commission's objectives.

We don't require special privileges but hope to receive them similarly to others. We hope the Government will understand our classification as electric and clean emissions vehicles, even though our technology is innovative.

We also hope the Government will see the scope of ways to progress the community in the renewable energy industry. Like computing and Cloud, there is a huge opportunity in distributed energy storage, and grid and intra-grid sharing versus simply remote or off grid.

Also there are emission free vehicle categories throughout Europe and Asia and other parts of the world where there are many community benefits. We hope the Government will give consideration to the range of these for New Zealand. Renewable energy aside, in the transport arena one only has to look across scooters, motorcycles, street bicycles, heavy trucks and buses, to see the scope of what the legislation covers. On a similar vein the L7e quadracycle will provide another good mode of clean affordable transport as they do in Europe. And they have huge commercial and gated community applications as well.

The industry will struggle as long as the economics is overruled by the social ethics (climate), health (pollution), and politics (direction). What is needed is for the economics to prevail. Whilst that is difficult during transition, innovation can do it. Our technology seeks to do exactly that, enabled progressively via identified energy sectors and vehicle applications, moving forward onto mass energy, infrastructure and economic application.

And it is the result of two decades of development, for which we are seeking commercialisation in New Zealand, just as it is taking place initially in Europe.

With congested cities, parking and traffic, taxis and Uber, GoGet, car hire, and areas yet unthought of, the MDI smaller vehicle range can be a great addition to city and suburban traffic and infrastructure savings. And totally clean.

We would like to take this opportunity to compliment the Commission and the Government on the work and initiatives they are undertaking in this field, and especially for the opportunity to make this submission.

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REFERENCES & LINKS

1) Relevant Company Web sites:

Air Future Limited – <http://www.airfuture.co.nz>

Air Volution Group Pty Limited – <http://www.airfuturegroup.com.au>

MDI – <http://www.mdi.lu>

2) Supportive Information:

United Nations Presentation link

http://media.wix.com/ugd/3017b1_aa5c208049d2414fb89daecb9a81e1ba.pdf

Vehicle and Energy Products

<https://www.airfuture.co.nz/who-we-are-2>

Air Future Ltd – Video

<https://www.airfuture.co.nz/campaign-videos>

Endnotes

ⁱ “Sustainability is Wishful Thinking” Stuff, John MCone 14/11/2020
<https://www.stuff.co.nz/environment/climate-news/122689734/sustainability-is-wishful-thinking-get-ready-for-the-energy-downshift>

ⁱⁱ United Nations Conference on Trade and Development – 22/07/2020 <https://unctad.org/news/developing-countries-pay-environmental-cost-electric-car-batteries>

ⁱⁱⁱ The Hidden Carbon Footprint of Electric Cars – Stuff, Olivia Wannan 12/03/2021
<https://www.stuff.co.nz/environment/climate-news/124499832/the-hidden-carbon-footprint-of-electric-cars>