



Authorised
Investment Fund Ltd.

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Wednesday, 2nd November 2016

LETTER TO SHAREHOLDERS

Latest Update of SSAS Green Ammonia Project Attached

Cathy Lin

Company Secretary

- Ends -



Authorized
Investment Fund Ltd.



ALCHEMY *of* AIR

SSAS Green Ammonia Project - An Overview

Authorized Investment Fund Ltd is leading the financing of the commercialisation of a new technology to produce affordable, environmentally friendly ammonia.

NOVEMBER 2016

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SSAS “GREEN AMMONIA” PROJECT



INTRODUCTION

- Authorised Investment Fund Ltd. (henceforth referred to by its Australian Stock Exchange code “AIY”) has agreed to purchase up to 30% of Australian technology company Alchemy of Air Pty Ltd (“AOA”).
- AOA is involved in the commercialising of a revolutionary and unique ammonia production technique called Solid State Ammonia Synthesis (“SSAS”), with the exclusive rights to manufacture and roll out the technology in a territory that includes Australasia, the majority of Asia and the Middle East including Israel. Additional countries are open for negotiation.
- The technology has significant potential to enhance the industry, wherein approx. 180 million tonnes of ammonia valued at over \$100 billion are produced annually. Ammonia (NH₃) is widely seen as the pathway to a hydrogen economy: such an advent would dramatically increase demand.
- The technology has been developed and patented by US-based technology group NHThree LLC (NHThree), who have developed a compelling new process of not only cost competitive but environmentally-friendly ammonia production at industrial scale.
- The SSAS plants will differ from the standard Haber-Bosch plants through the following
 - Reduced Capital and Operating costs
 - Ability to be more modular in design, hence plug and play design, remotely monitored and suitable for remote locations
 - Being environmentally friendly
 - Not needing natural gas or Coal gas as a feed stock.
- AIY is raising money to facilitate (1) the commercialisation process over 18 - 20 months, and (2) the formation of an SSAS Ammonia company with plants located around the aforementioned territory.
- As a Pooled Development Fund, AIY pays 15% company tax and investors pay no capital gains tax. AIY is listed on the ASX and has investments in materials, new energy and pharmaceuticals.

THE VISION: 2020 - 2030

This is the vision we have of the decade 2021 to 2030 as our technology is taken up.

- The world is discussing the outcomes and promises of the [2015 United Nations Climate Change Conference](#) in Paris and what to do next – with the knowledge that there is a clear alternative.
- In Australia there has been a clear strategy formulated between Governments and Industry bodies and the outcome has been collaborative work on renewables that has resulted in all forms of renewables contributing to Green Power, fuel and manufacturing. There has been a very positive focus on Australia being a leader in Renewables with exports booming, manufacturing revitalised and the film industry tripping over themselves to get some clean air shots down under.
- By 2020 the disorganised “Gold Rush” for renewables in Australia has settled down and looks more sustainable
- Australia is now assisting Japan to a Zero Carbon and Hydrogen future through a Solar Fuels initiative. AOA’s contribution has forged a significant new export business to Japan through the export of Green Ammonia as the rich source of Hydrogen
- Australia, itself, is now moving toward liquid fuel independence with the introduction of Ammonia as a fuel and the dominance of new cars being electric.
- Vehicle conversions are now common place to handle renewable fuels like Ammonia for trucks, trains, ships and planes.
- Remote communities, farms and mines are starting to become more energy and fertiliser independent and mines are producing their own bulk explosives on site which has come with access to small, modular Ammonia Plants. This has significantly improved the economics of these sectors
- SSAS modular plants are acting as energy stores across the country. This is harnessing Australia’s natural energy endowment and moving Australia to a reliable and sustainable 100% renewable powerhouse.
- As we grow into one of the worlds true renewable energy superpowers - Three scenarios unfold 1. energy intensive industries relocate to Australia to take advantage of reliable, cheap, green energy, 2. Businesses that don’t relocate import green ammonia from Australia or 3. produce their own green ammonia from modular Ammonia plants leased from Australia. The concept of large single power sources has finally been challenged
- The Australian army adopts Ammonia as a single fuel and gains significant strategic and resilience benefit

PROJECT OVERVIEW

AOA is collaborating with a USA-based research group, NHThree, to commercialise a unique, patented process that produces ammonia using Solid State Ammonia Synthesis (SSAS) without the need for a natural gas or coal gas feed source.

AOA management signed an agreement with NHThree after their due diligence concluded that the technology had enormous commercial potential in the hundred billion dollar ammonia market, apart from its potential use in the renewable energy equation.

Under the terms of the agreement AOA has the exclusive rights to market and build the SSAS-based plants in Australia to cover a defined "Territory" that includes Australian, Japanese and other major Asian and Middle Eastern markets. With the opportunity for consideration of other countries.

AIY's investment in AOA will facilitate AOA to:

- 1) Fully commercialise the process
- 2) Build a 1 tonne per day (tpd) pilot plant in Australia for use in a future research facility and a 5-10tpd commercial-scale SSAS Ammonia plant, also in Australia
- 3) Become a manufacturer of commercial-scale SSAS Ammonia plants.
- 4) Set up an Ammonia R&D hub in conjunction with Australian partners to build a centre of excellence for ongoing R&D into Ammonia and related technologies and applications
- 5) Develop a pipeline of projects for SSAS-based Ammonia Plants.

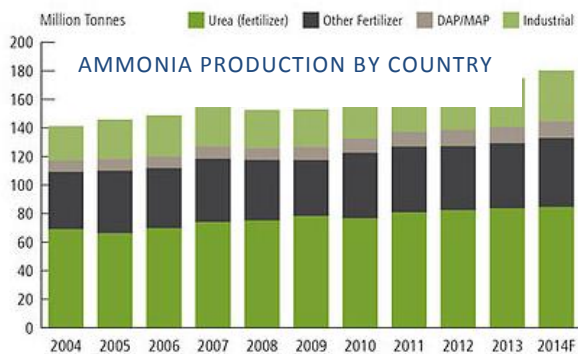
THE AMMONIA MARKET

TODAY'S MARKET

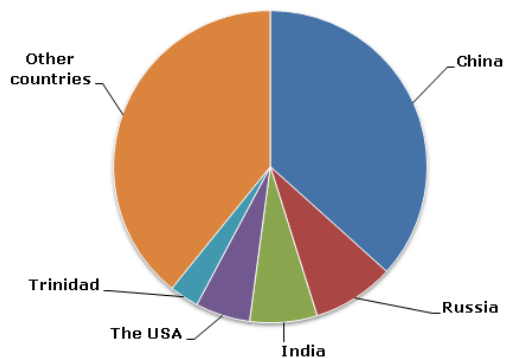
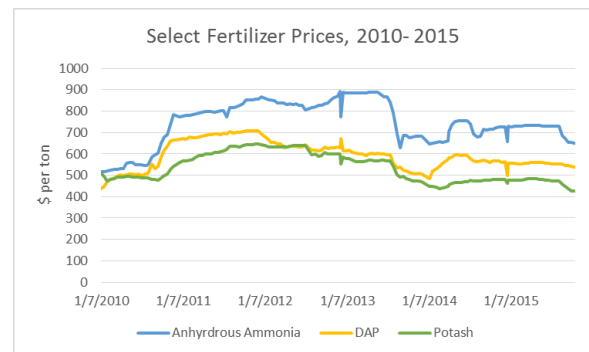
The ammonia market at a glance:

- Ammonia is the second most produced chemical in the world, with approximately 180 million tonnes produced per annum, world-wide.
- It's speculated that the world could only feed 4 billion people without ammonia products.
- The price of ammonia has ranged between \$US500 and \$US900 per tonne in the last 5 years.
- Ammonia is predominantly used for fertilisers, explosives, industrial processes and refrigeration.
- Ammonia consumption is rising at approx. 3% per annum, in these areas alone.
- The biggest producers of ammonia are China, Russia, India and the USA.
- Australia produces less than 1% of the world's ammonia.

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AMMONIA AS A FUEL – A CATALYST FOR GROWTH

As ammonia is a rich and stable form of Hydrogen and many experts see ammonia as a good transport and storage mechanism towards the world using hydrogen widely as a fuel. Serious uptake of ammonia fuel will certainly increase demand for ammonia, especially considering its greater 'green' credentials.

Ammonia has several advantages over the direct use of hydrogen gas as a fuel, namely:

- Ammonia can be stored and transported utilising existing infrastructure. It doesn't need to be stored at high pressures.
- Ammonia is not explosive and has no known flash point.
- Ammonia has 45% more energy than the same volume of hydrogen gas.
- Ammonia is an excellent fuel that produces no greenhouse gases and can be used in a number of applications. The fastest manned flight for example occurred 49 years ago using an ammonia fuel. It reached Mach 7, twice the speed of a bullet.
- 100 Belgian busses also ran on ammonia during WWII when there was a diesel shortage.



AMMONIA PRODUCTION METHOD

THE HABER-BOSCH METHOD

- The vast majority of ammonia today is produced using the 100-years-old Haber-Bosch (“HB”) method.
- The HB method involves a chemical process in which methane from natural gas or coal gas and oxygen form ammonia under extreme pressures and temperature.
- HB ammonia plants typically produce 400,000 to 800,000 tonnes per year.
- For reference, Incitec Pivot’s plant opened in October 2016 (in the USA) cost \$US850 million with a 750,000 metric tons of ammonia per year.
- 350 – 550 ° C temperature and 200+ atmospheres of pressures is required for HB production. This requires massive energy input with natural gas the most common feedstock.
- Current production using the HB method accounts for as much as 3% of the world’s greenhouse gas production.
- Natural gas prices and availability greatly affect the cost of ammonia produced and ability for certain countries to be ammonia independent.

OVERVIEW OF SOLID STATE AMMONIA SYNTHESIS

Solid State Ammonia Synthesis is an energy-efficient and clean method of producing Ammonia.

In SSAS, a proton-conducting membrane is heated and Nitrogen taken from the air is admitted to one side of the membrane and water vapour is admitted to the other side to drive the reaction.

It is anticipated that due to the lower energy consumption of the SSAS process it should produce ammonia at a lower cost than the Haber-Bosch process, with the obvious environmental advantages of not using fossil fuel feedstock.

Given that a large part of the SSAS plant will be made of ceramic materials and modular replaceable components, it is anticipated that the life of a plant will add to the sustainability of the Ammonia story.

ADVANTAGES OF THE SSAS TECHNOLOGY

Potential advantages over current production methods include:

- 1) Lower temperature and pressure requirements for production
- 2) Lower energy requirements.
- 3) Lower capital costs both overall and on a per-ton-per-day basis
- 4) Modular Plug and Play design
- 5) No hydrocarbon feed source required – can be powered by wind, solar, or other renewables
- 6) Can be built on small scale and in isolated locations, offering distributed power and fertiliser production
- 7) Can be built to require minimal workforce apart from maintenance
- 8) Zero greenhouse gas emissions

INDICATIVE ECONOMIC COMPARISON FOR NH₃ PRODUCTION METHODS*

	Haber-Bosch Natural Gas Feed	Electroliser + H-B	SSAS*
Energy required per tonne of NH ₃	10,600 kWh	13,000 kWh (H ₂ production only)	7-8,000 kWh*
Capital cost, \$/t/day NH ₃ capacity	\$500,000	\$750,000	\$200,000*
"Fuel" cost to produce 1 tonne of NH ₃ at large scale (1)	Depends on location and NG cost (1)	\$460 (Power cost – 3.5 c/kWh) \$260 (Power cost – 2.0 c/kWh)	\$270 (Power cost – 3.5 c/kWh)* \$155 (Power cost – 2.0 c/kWh)*
Total cost to produce 1 tonne of NH ₃ at moderate to large scale (2)	Depends on location and NG cost	>\$660 (Power cost – 3.5 c/kWh) >\$440 (Power cost – 2.0 c/kWh)	\$345 (Power cost – 3.5 c/kWh)* \$230 (Power cost – 2.0 c/kWh)*
Tonnes of CO ₂ emitted per Tonne of NH ₃ produced	1.8	0	0

- (1) 2.0 c-3.5c/kWh for power on close proximity to a hydro source
- (2) Using a Capital recovery factor of 12% and N₂ purchased @\$30/tN₂
- (3) All in USD
- (4) Estimated, 2007

*Indicative figures only, calculated by NHThree LLC from published peer reviewed research. Projections currently unsubstantiated by AOA or AIY at this stage. Note: tonnes have been up-scaled from US tons as has kWh to reflect metric tonnes produced.

INTELLECTUAL PROPERTY

AIY/AOA are tied to the IP in several ways:

- 1) AOA's American partners, NHThree, have assigned exclusive rights to the IP in the assigned territory by way of a contractual arrangement.
- 2) AOA has exclusive rights to all IP it gains through the commercialisation process in Australia.

COMMERCIALISATION PROCESS

TIMELINE

The chemical equation behind the SSAS technology has been demonstrated to work in the real world and, henceforth, scaling up to commercial scales has been notably de-risked. The timeline from design to build the first pilot plant is anticipated to occur within 14 – 18 months.

Task	Time (months)
Engineering Design	6
Bench testing	6
Construction 1tpd pilot plant	6
Engineering for 5-10tpd plant	3
Construction 5-10tpd plant	9

AOA and AIY will concurrently ensure that commercial partnerships are formed to ensure the rapid roll-out of the SSAS plants upon successful completion of the pilot plant.

Several partnerships have already been formed to minimise the timeline, namely:

- AOA have aligned themselves with a company that will create a digital simulation of the system so simulations of different pressures, temperatures and tolerances can be run in order to ensure that the first commercial-scale build is largely optimised.
- AOA have engaged commercial partners to develop the ceramic components of the build, which represent the most difficult and cost-intensive part of the system. All other parts of the plant (excluding the SSAS module) can readily be bought off the shelf from various manufactures.

COST OF PLANTS AND PAYBACK

At this early stage, exact cost breakdowns are not yet available; notwithstanding, the cost estimations at hand point to sound investment dynamics.

It is anticipated the Payback on a 5-10tpd plant will be approximately 2-3 years if the plant cost is around \$5 million and the ammonia price is towards the lower boundary of the 5 year range (\$500/t).

Payback on the plant will be approximately 9 months in a scenario where ammonia prices resemble the five year high (\$900/t) and the build cost is at the lower end of the anticipated range (\$3M).

DETAILS OF THE INVESTMENT

COMMERCIALISATION PHASE

- The entire commercialisation process from design to the first 5 - 10 tonne per day plant is anticipated to cost approximately \$A10 million.
- AIY has reached terms with AOA to acquire 20% of the company.
- Under the terms of the agreement Authorised Investment Fund Ltd. will issue nine million (9,000,000) shares at the price of ten cents 10c per share for the total consideration of nine hundred thousand Australian dollars (A\$900,000) to Alchemy of Air.
- AIY will furthermore invest up to \$1.3 million towards project costs over the next two years to facilitate the commercialisation process.
- AIY has an option to acquire a further 10% of AOA, to bring its ownership to 30%, by investing a further \$3 million in AOA.

COMMERCIAL ROLLOUT

Within 12 months the commercial viability of SSAS plants will become more quantifiable. At this point, suitable investors that backed the commercialisation process will be invited to participate in the formation of a new company founded to build SSAS based ammonia plants.

It is anticipated that between AUD 25 million and AUD 100 million will be raised at this juncture.

CONTACT



Authorised
Investment Fund Ltd.

Assigned Contact: Andrew Mendelawitz, Strategic Advisor

Phone: +61 3 9600 3242

Email: andrewm@authorisedinvestmentfund.com.au

Level 9, 406 Collins Street,

Melbourne, Victoria, Australia, 3142

www.authorisedinvestmentfund.com.au

