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Sector Review

3 February 2020

Analyst : Warwick Grigor

High Purity Alumina (HPA)

"Looking for growth opportunities in the battery space"

Investment Perspective: Investors seeking to profit from the growth in the battery markets may look at the emerging High Purity Alumina (HPA) sector as a way to participate, without worrying greatly about standard mining and resource risk. However, as a new specialty sector, we do not have the advantage of being able to benchmark companies against industry leaders. Some companies are more advanced than others but none have yet made it to the point of full scale production, let alone commercial viability. Everyone is on a learning curve, including the companies. This means that it must be seen as a high risk sector in which to invest.

While a company may be in a sector that offers great opportunity and growth potential, history tells us that only the best companies will survive. How do we know what the best companies are when we come from a background of ignorance? Do we believe the most emphatic and seductive promoters as these people are most likely to be better share price movers, or do we dig deeply into the science to get a better, technically based view? Is it better to get it right in the short term or the long term? It depends on whether you want to play the market or the fundamentals. Trade or invest?

We have prepared a comparative table of the leading candidates in the HPA sector as the first step in making sense of the business, based on publicly released information. We have ranked the companies in tables of a number of characteristics. We can now look deeper as we seek to explain the differences.

	ALPHA HPA	ALTECH CHEMICALS	FYI RESOURCES	PURE ALUMINA	SALAZAR MINERALS
ASX Code	A4N	ATC	FYI	PUA	Pre-IPO
Market Cap'n	\$189m	\$76m	\$11.3m	\$2.3m	\$13.813m
Price (7/2/20)	27.0¢	9.1¢	5.1¢	1.0¢	n/a
Shares (fully paid)	632 mill	809 mill	212 mill	222 mill	69 mill
Options & PR	68 mill	27 mill	11 mill	11 mill	0 mill
Cash Balance (30/9/19)	\$80m	\$2.6m	\$0.925m	\$1.1m	n/a
Next Qtr Exp. Estimate	\$22.9m	\$8.8m	\$0.4m	\$0.5m	n/a
Latest Funding	\$3.5m, 10¢, July '19	\$2.8m SPP, 9.7¢, Jan '20	\$0.81m, 5¢, June '19	\$1.75m, 3.4¢, June '19	n/a
Major Shareholders					
# 1	Norm Seckold 10.6%	Deutsche Balaton 9.4%	Regal 12.9%	Tolga Kumova 7.1%	Mark Bolton 50%
# 2	Rolling Hill Capital 6.6%	SMS Investments 7.7%	Andrew Spinks 11.5%	Tom Eaddie 3.7%	Shining Capital 10%
# 3	BT Portfolio Serv. 5.4%	Delphi Unternahm. 6.8%	Rolyand Hill 10%	Robert Hallas 2%	Ken Rogers 8%
Greatest Positives	unique feedstock	Advanced status	geology/metallugy, location	not advancing	chemistry of orebody
Greatest Positives	secrecy of feedstock	high capex, opex	low mkt cap'n	n/a	Pre-IPO & access to funds

Disclosure: Interests associated with the author own shares in Alpha HPA. No fees have been paid to FEC by any of the companies.

This research report is provided in good faith from sources believed to be accurate and reliable. Far East Capital Ltd directors and employees do not accept liability for the results of any action taken on the basis of the information provided or for any errors or omissions contained therein.

Quick Comments and Ranking Tables

Company	Comments
Alpha HPA	Most highly valued by the market, so this could assist with financing. Innovative front end involving no mining, with SX recovery. Secretive aspects make it harder to evaluate technical aspects.
Altech Chemicals	Most commercially advanced with construction of site facilities, partially financed, but most expensive on capex and opex comparisons
FYI Resources	Conventional processing methodology, low jurisdictional risk, but low market capitalisation increases financing risk. Technically sound.
Pure Alumina	Capex estimates too high though can be improved. Tried innovative approach with Orbite technology but they unable to raise \$30m needed. So it was back to the conventional approach, but the company has lost interest in the project and not intending to pursue it. Orbite has subsequently gone into administration
Salazar Minerals	Still a private company that is less advanced on the path to pilot testing. Early numbers seem to be the lowest capex and opex, but verification needed. Particularly favourable metallurgy from the orebody. Jurisdiction risk in shipment of ore to India for processing.

Capital Expenditure Measures							
Total Capex Capital Intensity							
1	Salazer Minerals	\$36m	36m 1 Salazer Minerals \$7,186/t				
2	Alpha HPA	\$150m	2	Alpha HPA	\$14,706/t		
3	FYI	\$178m	3	FYI	\$22,250/t		
4	4 Pure Alumina \$271m		4	Pure Alumina	\$33,875/t		
5 Altech \$298m		\$298m	5	Altech	\$66,222/t		
Ranked from lowest to highest							

Operating Cost Measures					
1	Salazer Minerals	\$4,140/t			
2	Alpha HPA	\$5,123/t			
3	FYI	\$6,467/t			
4 Pure Alumina		\$7,668/t			
5	Altech	\$9,900/t			
	Ranked from lowest to highest				

Scale of HPA Production					
1	Alpha HPA	10,200 t			
2	FYI	8,000 t			
3	Pure Alumina	8,000 t			
4 Salazer Minerals		4,940 t			
5	Altech	4,500 t			
Ranked from highest to lowest					

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What is HPA and How is it Made?

What is high purity alumina (HPA)?	High-purity alumina (HPA) is a processed premium non-metallurgical alumina product characterised by its purity level i.e. 99.99% (4N), 99.999% (5N). The market price, application and performance of HPA varies widely according to its degree of purity.
Different methods of making HPA need to be considered	 HPA can be made by a number of different methods, such as; hydrolysis of aluminium alkoxide thermal decomposition of ammoniumalum thermal decomposition of ammonium aluminium carbonate hydroxide (AACH) underwater spark discharge with aluminum vapor-phase oxidation. The most common method is the hydrolysis of aluminium oxide, whereby high purity aluminum alkoxide is synthesised from aluminum metal and alcohol, and hydrated alumina is produced by hydrolysis of alkoxide. HPA is then obtained by calcination.
The merging trend is for HPA production from an ore feedstock such as kaolin or aluminous clay	 The emerging trend is for HPA production from an ore feedstock such as kaolin or aluminous clay, in a hydrochloric acid leach process. This involves the following steps; campaign mining and transporting of raw material kaolin to distant HPA plant feedstock scrubbing and screening calcining at approx. 700 degrees to crack the crystal structure, to make metakaolin hydrochloric acid leaching (HCl) of metakaolin three stages of crystallisation by adding HCl gas to make ACH (aluminium chloride hexahydrate) roasting crystal product at 700 degrees, then calcining at 1,200 degrees to make beads micro-grinding beads (jet milling) to achieve final product of 4N HPA Most of the companies covered in this research are employing this methodology. Companies will try to promote their feedstock as having superior metallurgical qualities arising from geological location and metallurgy, but each claim needs to be assessed on it merits to see whether the difference is material, particularly as to whether it can lead to better performance of economies in the HPA production process.
Differences in processing techniques need to be considered	It is common for companies to promote that their process circuits give them a unique advantage, but the never tell you exactly what it is. That makes it more difficult to assess. In the case of Alpha HPA, it is truely very different as it is SX-based, but the company won't tell you what the secret ingredient is at the front end. Other companies will say that their kaolin input has unique qualities that come with the geology. These are points of differentiation but how material are they really?
Consistency of reporting feedstock grades would be useful	Relative comparison of projects requires consistency of reporting methodology across the sector. It is important to look at the grades of kaolin being reported by various companies to determine whether they are in-situ or beneficiated. Though, grade in itself is not the most important factor.

The High Purity Alumina Market

What are its uses?	HPA is mainly used for its superior properties, such as corrosion and scratch resistance, high brightness, and its ability to withstand extreme temperatures. It is used as a base material in the manufacture of sapphire substrates for applications such as light emitting diodes (LEDs), in the manufacture of artificial sapphire glass (eg mobile phone and television screens) and in certain battery and power storage components; artificial gemstones; and special space, aeronautical and medical applications.
Market expected to grow by 21.8% p.a.	The Global High Purity Alumina Market is expected to grow at a CAGR of 21.8% during the forecasting period from 2019 to 2026 (<i>Source: Data Intelligence Report, 10 Jan 2010</i>)
What are the main uses of HPA?	High purity alumina (HPA) is a high-value, high margin and highly demanded product used primarily to manufacture industrial sapphire substrates in electronics, production of synthetic sapphire, LED lighting applications, in plasma display panels such as those found in handheld devices, laptops, televisions, and cellular phones.
Areas of market expansion for HPA	Recently, the demand for high purity alumina is expanding in fields which are expected to show a high growth rate, e.g., display materials, energy, automobiles, semiconductors, and computers. To attend to these needs, Sumitomo Chemical established mass production technology of high purity alumina using a unique process of hydrolysis of aluminum alkoxide
LED lighting is a big driver	The rising demand for high-purity alumina in LEDs is propelled by the growing adoption of LED lighting technology on a global basis. For instance, according to the U.S Department of Energy in 2017, from 2014 to 2016, installations of LED products have increased in all applications, more than quadrupling to 874 million units, increasing penetration to 12.6% of all lighting.
Use in separators in batteries offers greater growth	High purity alumina demand is also surging with the rising demand for electric vehicles in the form of batteries separator. For instance, According to China International Battery Fair (CIBF) report, 99.99% (4N) HPA is currently being supplied to Chinese lithium-ion battery separator sheet manufacturers at RMB180 to RMB200 per kilogram (US\$27 to US\$30 per kilogram).
Market is dominated by a few players	The global high purity alumina market is highly consolidated with a few leading players accounting dominating the market. Sumitomo Chemical Company and Sasol Limited, and are prominent companies. These businesses have own one-third of the supply of the global high purity alumina, while China accounts for more than 50% of the world supply

Slides on HPA from Alpha HPA Presentation

Alpha HPA can reasonably claim to the the sector leader based on its market acceptance, demonstrated by the market capitalisation. We have taken some slides from Alpha's presentation showing;

- 1. the project market for HPA
- 2. suppliers to the market
- 3. the use of HPA in separators for lithium-ion batteries





countries, and more importantly Fill an expected supply shortage as forecast HPA demand escalates over the

next decade

HPA – A critical part of the EV/battery revolution

- High Purity Alumina (HPA) is the pure form of aluminium oxide (Al₂O₃). HPA is a pre-cursor material for the manufacture of ceramic coated Lithium-Ion-Battery (Li-B) separators
- Ceramic (HPA) coated separators and/or ceramic coated electrodes are a key safety and performance element for the high-temperature EV batteries
- Ceramic (HPA) coating provides thermal stability whilst allowing ionic exchange
- Ceramic (HPA) coating of electrodes now a key Li-B trend, connected to reduced cobalt cathode chemistry

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High Purity Alumina

e (Al₂O₃). HPA is a pre-cursor (Al₂O₃). HPA is a pre-cursor tattery (Li-B) separators rodes are a e EV batteries e - e - e - Cathode HPA-coated Separator HPA-coated

Anode

Aloha **HPA**

ASX HPA Companies 8/2/20 Copyright © Far East Capital Ltd AUD/USD 0.7000						_
	ALPHA HPA	ALTECH CHEMICALS	FYI RESOURCES	PURE ALUMINA	SALAZAR MINERALS	
FINANCE	A4N	ATC	FYI	PUA	Pre-IPO	Γ
Market Cap'n	\$189m	\$76.094m	\$11.383m	\$2.329m	\$13.813m	ſ
Price (7/2/20)	27.0¢	9.1¢	5.1¢	1.0¢	n/a	Ĺ
Shares (fully paid)	632 mill	809 mill	212 mill	222 mill	69 mill	Ĺ
Options & PR	68 mill	27 mill	11 mill	11 mill	0 mill	Ĺ
Cash Balance (30/9/19)	\$80m	\$2.6m	\$0.925m	\$1.1m	n/a	F
Next Otr Exp. Estimate	\$22.9m	\$8.8m	\$0.4m	\$0.5m	n/a	F
Latast Eurolina	\$2.5m 104 July 10	\$2.8m SDD 0.74 Jan '20	\$0.81m 54 June '10	\$1.75m 2.44 June \$10	n/a	⊢
	\$3.5m, 10¢, July 19	\$2.8m SPP, 9.7¢, Jan 20	\$0.81m, 5¢, June 19	\$1.75m, 5.4¢, June 19	n/a	⊢
Broker	-	-	Foster	-	-	L
Major Shareholders						L
# 1	Norm Seckold 10.6%	Deutsche Balaton 9.4%	Regal 12.9%	Tolga Kumova 7.1%	Mark Bolton 50%	L
# 2	Rolling Hill Capital 6.6%	SMS Investments 7.7%	Andrew Spinks 11.5%	Tom Eaddie 3.7%	Shining Capital 10%	L
# 3	BT Portfolio Serv. 5.4%	Delphi Unternahm. 6.8%	Roland Hill 10%	Robert Hallas 2%	Ken Rogers 8%	
Greatest Positives	unique feedstock	Advanced status	geology/metallugy, location	n/a	chemistry of orebody	Γ
Greatest Negatives	secrecy of feedstock	high capex, opex	low mkt cap'n	n/a	Pre-IPO & access to funds	Γ
PROJECT TESTWORK & MILESTONES						Ē
Studies Done	PES Eeb '19	Final Inv. Decision Oct '17	PFS Sent '18	PES June '18	Scoping June '19	F
Panding Milastones	DES Des '10 off takes	Mazzapina dabt sala of 40%	DES due Dec '10	On hold	Branaring for IPO	F
rending milestoffes	Pilot plant July '10 Working	mezzamie ucot, sale 01 49%		On hold after \$27m Polor		F
Current Status	on DFS now. Due March '20	FIDS done Oct 2017	Pilot plant operated	HPA deal failed	Seeking funding for PFS	
Operating Period of Pilot	giving total 600 hours	n/a	7 days, 24 hpd	n/a	n/a	
Grade Achieved Al ₂ O ₃	99.999% achieved	99.995%	99.997%	99.999%	99.99%	L
Product Sample Size	4kg/day, 15 kg HPA		1 kg/hr		n/a	
Consultant	Prudentia Process Consul.	TSW Analytical Pty Ltd, Perth	GR Engineering/CSA	BHM, ALS, Primero	TSW Analytical, Nagrom	
Construction Begins	Mar Q, 2020	Stage 1 completed. Stage 2 engineering in progress.	After financing, in mid 2020	Q1 2020 (not anymore)	Early 2021	
First Prod'n, Ramp up	Mar Q, 2022		18 mths construction, 6 mths	not advancing	Early 2022	Γ
RESOURCE/RESERVES						
Background						Γ
Orebody Name	n/a	Meckering WA	Cadoux WA	Yendon VIC	Newmont	F
Orenerskin	11/ 4		1000	1000	1000%	H
Ownersnip	-	100%	100%	100%		⊢
Location	-	140 km E of Perth	220 km NE Perth	Near Ballarat, Victoria	125 km NE Esperance, WA	L
Infrastructure	-	via Great Eastern Hwy	Kwinana Industrial Area		port, rail, air nearby	L
Permit Status	-	Granted ML. All approvals	Granted ML	Seeking retention licence	Exploration Licence. Need ML & Native Title	
Description	-	high quality kaolin, low in sodium and iron impurities	Flat lying, free dig	shallow, max. depth 30m, average 20m	near surface kaolin clays, also rare earths 0.25-0.35% REE, to 20m depth	
Waste:Ore	-	0.64:1	1.1:1	0.7:1	< 1 to 1 (10m overburden)	Γ
Mining Method	-	open pit, 10 separate campaigns of 2-3 mths, 3 years between each	open pit, campaign, 3 mths mining gives 3 yrs supply	open pit, rippable, campaign of 2-4 weeks	free dig, campaign mining 4 mths p.a.	
Ore Delivery Rate	-	43,500 tpa	24,500 tpa, beneficiated	F	32,000 tpa	
Pre-treatment	-	trommel screen to remove > 12mm	wet screening, beneficate to 105µm, 50% mass pull	screened with 63µm size cut-off to remove silica, 43% mass pull	screening to lift head grade to +38% Al ₂ O ₃	
Port	-	Fremantle, 153 km	Kwinana, WA	Melbourne, VIC, 100 km	Esperance, WA	L
Transport to port	-	20 ft shipping containers, 36 per wk	truck		20 ft shipping containers	
Mine Life		30 yrs	25 yrs +	38 yrs	15 yrs +	ſ
Resources						Γ
Measured	-	1.5 Mt	-	1.73 Mt	-	Ē
Grade Al2O3	_	30.0%	-	35% post screening	_	F
Indicated	-	2 2 1.4+	2.0 M+	1 05 M-	-	F
Grada AlaOa	-	20.00%	3.2 IVIL	1.95 MI	-	F
Urate Al2O3	-	30.0%	24.4%	34% post screening	-	⊢
Interred	-	7.9 Mt	6.3 Mt	-	3.4 Mt	L
Grade Al ₂ O ₃	=	29.1%	22.3%	-	31.2%	L
Total Resource Tonnes	-	12.7 Mt	9.5 Mt	3.68 Mt	3.4 Mt	L
Grade Al ₂ O ₃	-	29.5%	29.5%	34% post screening	31.2%, 803 ppm TREO	L
Reserves						ſ
Proved Reserve	-	0.45 Mt	0 Mt	n/a	n/a	Γ
Grade Al2O3	-	30.1%	0.00%	n/a	n/a	È
Probable Reserva	-	0.77 Mt	2 % M+	n/a	n/a	F
Grada ALO	-	20.00	2.0 IVIL	11/a	11/a	H
Grade Al ₂ O ₃	-	30.0%	24.5%	n/a	n/a	⊢
Total Reserve Tonnes	-	1.22 Mt	2.8 Mt	n/a	n/a	L
Grade Al ₂ O ₃		30.0%	24.5%	n/a	3.4 Mt	L
PROPOSED HPA PROJECT	1					
Location	Gladston, Newcastle,	Johor Malavaia	Kwinone WA	Malhourna VIC	Hogino Chimat India	1
Location	Kwinana??	Jonor, wiaraysia	Kwinana, WA	wieldourne, vic	Tiazira, Gujurat, India	L

Infrastructure	First world	Three ports, power, gas, road, telecom.	First world	First world	grid power, gas, industrial park
Relevant input availability	First world	HCl acid and quicklime plants, gas, high voltage power	First world	First world	local acid supply
Tenure	n/a	30 year lease +	6 ha lease at Kwinana site		99 lease planned
Process Steps Description	HPA First process. hydrometallurgical. SX, crystallisation & filtration	beneficiation, calcination, acid leaching, crystallisation, purification, roasting, final calcination	purpose built 3 stage HCl acid leach & precipitation circuit	leaching in HCl, precipitation of Al ₂ O ₃ into crystal and repeat	screening & calcining, atmospheric HCl leach, ACH precipitation & purification, ACH calcination
Pretreatment/Benefication	3rd party, modified industrial chemical feedstock, so no beneficiation needed	Wet screening to reduce kaolin to <300μm & remove silica	Wet screening to reduce kaolin to $<105\mu$ m, remove silica, grade lifts to 45-46% Al ₂ O ₃	wet screening	wet screening at 50µm
Calcining to make metakaolin	n/a	at 700°C in rotary kiln, cooled, screens and crushed to <300µm	at 700∘C in rotary kiln, cooled, already to <105µm	650-700 ⁰ kiln	can circumvent this step, but recovery rate falls from 95% to 91%
Leaching	aluminium solvent extraction avoids chlorides & HCl	Calcine mixed with HCl at ~30%w/w. Makes high concentration AlCl ₃ Silica residue filtered & neutralised	~30%w/w HCl, gives high grade Al ₂ O ₃	~32%w/w HCl	leached at 19% HCl, at 900 for 3 hours for 95%, distilled & condensed
Crystalisation	makes an aluminium salt crystal from an electrolyte product (not AHC)	Aluminium chloride hexahydrate (ACH) is crystallised by increasing HCl acid concentration, adding anhydrous HCl gas. ACH crystals centrifuged and washed	Aluminium chloride hexahydrate (ACH) is crystallised by increasing HCl acid concentration, adding anhydrous HCl gas. ACH crystals centrifuged and washed	Aluminium chloride hexahydrate (ACH) is crystallised by increasing HCl acid concentration, adding anhydrous HCl gas. ACH crystals centrifuged and washed	Aluminium chloride hexahydrate (ACH) is crystallised by increasing HCl acid concentration, adding anhydrous HCl gas. ACH crystals centrifuged and washed
Re-dissolution	aluminium salt goes through a two crystallisation stages to make HPA, but gasses are benign and much safer	ACH crystals dissolved in demineralised water and into second crystallisation to remove residual impurities. Three rounds of this	3x iteration of process to crystallise	3x iteration of process to crystallise	3x iteration of process to crystallise
Heat treatment to make beads or powder	salt crystals come out at 300-400 μ m, then HPA is made at 0.3-20 μ m size. Micro- ground to reduce size to 0.1 to 2 μ m in autogenous grinding in mill with HPA hydrostatic lining, minimising impurities	ACH crystals heated to 700°C to decompose to alumina, removing HCl and H ₂ O to make HPA. Cooled, washed and ground to <1µm, dried & aggregated into beads for heat treatment (or micronised) to make powder.	goes in as 20μm gamma and comes out at 0.5-20μm alpha depending on customer specs. Needs to be 1,200°C to convert to alpha	1,2000	Two stages of calcination. Pre-calcine at 250°C to remove water, then calcine solids at 1250°C. Then micronised
Other					High value neodymium-heavy REE with little or no radioactivity, scandium & gallium, recovery from raffinate using ion exchange
Feedstock Throughput	65,753 tpa		24,000 tpa		32,000 tpa
Scale of Prod'n HPA tpa	10,200	4,500	8,000	8,000	4,940
Grade Construction Pariod	> 99.99%	> 99.99%	> 99.99%	99.999%	> 99.99%
Ramp-up Period	24 months	36 months	6 months		12 months
CAPEX & CONTRACTS					
Capex Stage 1 US\$	US\$150m	US\$298m	US\$178m	US\$271m	US\$14m
Stage 2 US\$	¢14.706+	¢(()))	\$22.250 st	\$22.975t	US\$22m
Contractor	\$14,706 pt	\$00,222 pt SMS Group GmbH	\$22,250 pt	\$33,873 pt	\$7,180 pt
Contract Type		Turnkey			-
Contract Value		US\$280m			-
FINANCIALS	¢5.100 ·	¢0.000 /	¢c 407 -	φ α . (co	¢4.140
Opex US\$ Selling price (in study) US\$	\$5,123 pt	\$9,900 pt \$26,900 pt	\$0,407 pt	\$7,068 pt	\$4,140 pt
Operating Margin		φ20,700 pt	\$17,533 pt		> 03430,000
Gross Cash Flow			US\$140m		
Capex Payback					
Offtake					
1.10.0		Mitsubishi, 10 yrs, 100%			
Life Span	n/a	Mitsubishi, 10 yrs, 100% 30 years			- 15 years +
Life Span FINANCING Senior Project Debt	n/a	Mitsubishi, 10 yrs, 100% 30 years US\$190m			
Life Span FINANCING Senior Project Debt Provider	n/a	Mitsubishi, 10 yrs, 100% 30 years US\$190m German Gov't, KfW IPEX- Bank			
Life Span FINANCING Senior Project Debt Provider Mezzanine Debt	n/a	Mitsubishi, 10 yrs, 100% 30 years US\$190m German Gov't, KfW IPEX- Bank US\$90m			
Life Span FINANCING Senior Project Debt Provider Mezzanine Debt Provider	n/a	Mitsubishi, 10 yrs, 100% 30 years US\$190m German Gov't, KfW IPEX- Bank US\$90m Macquarie Bank			- 15 years + n/a n/a
Life Span FINANCING Senior Project Debt Provider Mezzanine Debt Provider Other Corporate	n/a	Mitsubishi, 10 yrs, 100% 30 years US\$190m German Gov't, KfW IPEX- Bank US\$90m Macquarie Bank Option, AAM can buy 49% for US\$100m			
Life Span FINANCING Senior Project Debt Provider Mezzanine Debt Provider Other Corporate OTHER	n/a	Mitsubishi, 10 yrs, 100% 30 years US\$190m German Gov't, KfW IPEX- Bank US\$90m Macquarie Bank Option, AAM can buy 49% for US\$100m			
Life Span FINANCING Senior Project Debt Provider Mezzanine Debt Provider Other Corporate OTHER Major Issues	n/a	Mitsubishi, 10 yrs, 100% 30 years US\$190m German Gov't, KfW IPEX- Bank US\$90m Macquarie Bank Option, AAM can buy 49% for US\$100m			- 15 years + n/a n/a
Life Span FINANCING Senior Project Debt Provider Mezzanine Debt Provider Other Corporate OTHER Major Issues Option ex.	n/a	Mitsubishi, 10 yrs, 100% 30 years US\$190m German Gov't, KfW IPEX- Bank US\$90m Macquarie Bank Option, AAM can buy 49% for US\$100m			
Life Span FINANCING Senior Project Debt Provider Mezzanine Debt Provider Other Corporate OTHER Major Issues Option ex. Board Fees	n/a	Mitsubishi, 10 yrs, 100% 30 years US\$190m German Gov't, KfW IPEX- Bank US\$90m Macquarie Bank Option, AAM can buy 49% for US\$100m			- 15 years + n/a n/a

NED	\$55,000	\$70,000	\$30,000	\$40,000	n/a		
CEO/MD					n/a		
Cash	\$365,733	\$605,535	\$180,000	\$341,000			
Perform. Rights, opts	\$436,000	\$1,130,309	\$0				
Notes							
GDMS	Glow Discharge Mass Specto	ometry					
FIDS							
AICI3	aluminium chloride						
Altech	applied for patent & it was knocked back. Then applied for innovation patent and that knocked back too						
Salazar Notes							
Other Companies	Lava Blue (Qld), Orbite Tech	nologies (Quebec)					
	Started with bauxite waste -	red slimes, and wante	d RE from tails. Failed at fi	inal calcining stage. Ex	pensive salaries, four		
Orbite	hours from town. Spent app	rox. \$140m, and failed		5 5 .			
Pelaton	Private, in Sydney?						
James McKay	South of Weipa. private						