

# Aleees

#### New Energy Solution can be Self-Sustainable



# Energy Storage System Company



- Energy independence and air quality control are top national initiatives in Asia.
- Aleees' scalable business model will reach hyper-growth once the e-bus operating cost achieve diesel parity.

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## How the Business Model drives the Business

Cathode Material BU







- Leader in LFP cathode materials, with 20% global market share and 30% gross margin.
- 2. 90% customers are China battery cell makers.
- 3. Used in storage and powertrain batteries.

- Leader in Taiwan E-Bus with 41 buses on the road, claiming 50% market share.
- 2. SELL E-bus, but LEASE battery and battery swap station. Customers are **bus operators**.
- 1. Collaborate with China E-Bus manufacturers, target city population under 1.5 million.
- SELL E-bus, battery and battery-swap station. Customers are local governments and third-party energy service providers.

Note: LFP stands for lithium ferrous phosphate, LiFePO<sub>4</sub>



## Aleees Holds Key IP To Achieve Diesel Parity



#### Aleees has a Asset-Light, Virtually-Vertical-Integrated Business Model

Note: LFP-NCO stands for Lithium ferrous phosphate nano-cocrystalline olivine



# **Cathode Material BU**







### **Aleees Claims 20% of Global LFP Market**

#### **3 Key Differences:**

- ✓ Superior Cost/Performance: Customers using Aleees cathode material is able to charge 10% higher ASP with only 5% increase in cost to battery cell makers.
- Consistent Performance: Material uniformity is key to battery quality, creating strong customer stickiness.
- Excellent FAE Team: Experienced FAE team led by Aleees founder, an expert in electrochemistry, offer local support that help Aleees customers solving production problems.





Uniform Carbon Coating – Increase Life Expectancy





# Core Competitive Advantages

Unique NCO compound – High Capacity, Stable Structure



Nano-level Processing – High Yield Rate and Reasonable Cost





## LFP Materials Outgrow Others



Battery Chemistry:

LFP (LiFePO4 lithium ferrous phosphate), LMO (LiMnO2 lithium-manganese dioxide), LNO (lithium-nickel oxide), NMC (LiNiMnCoO2 lithium-nickel-manganese-cobalt-oxide), LCO ( lithium cobalt oxide) Table Source: IEK Report 2012.10

# **Different Materials for Different Applications**



Safe and long cycle life. High power. Less temperature concerns. Best for EV and storage.

Notebook or consumer product battery, but unstable. Safety and cycle life are also concerns.

Power tools and EV, but can't work under high temperature. Safety and cycle life are also concerns.

Handheld device battery, but unstable. Not for EV or HEV.

1900 Lead Acid Battery

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Consumer products and Hybrid Vehicles, high power but low energy density. Not for EV or PHEV.

Start up battery on all vehicles, but with hazardous material and short-lived.





## **Transportation: New and Replacement Market**

### New market: Electric Bus

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Source: Pike Research (2012.08)

### **Replacement: Lead-Acid**





## Where is LFP Material Market Demand

LFP Material	Stor	age	Transportation			
(Unit: MT)	2012	2015	2012	2015		
New Market	Grid (C	Global)	E-Bus <mark>(China)</mark>			
	400	4,000	1,200	4,400		
Replacement	Base Statio	on <mark>(China)</mark>	SSV (Global)			
	600	4,000	200	2,400		

- 1. Adding up storage and transportation sector, market demand increases from 2,400 tones in 2012 to 14,800 tons in 2015.
- 2. Include all other sector, worldwide LFP market demand will increase from 6,000 tones in 2012 to 18,000 in 2015, or CAGR 44%.

Note: Base Station is included in UPS/Stationary sector on page 7.





## **China Base Station LFP Demand**

Year	2012	2013	2014	2015
Battery Demand (RMB millions)	500	1000	1800	2500
LFP Demand (MT)	600	1,200	2,400	4,000

#### **Market Trend**

- 1. China base station increases from 2.25 million units in 2012 to 3.85 millions units in 2015.
- 2. Lead-acid battery is used as redundant battery on base stations. China Central Government recently includes LFP battery as one of the base station battery standard.
- 3. LFP battery demand rises from RMB 500 millions in 2012 to RMB 2.5 billions in 2015.





# **Electric Bus BU**





## **How Aleees LFP Improves Overtime**





Why Go for Electric Bus? Battery Design Technology Break Through

High Energy Density Lower Cost-per-kWh

Management

**System** 

Past — Future



**Material** 

Improvement



**Battery** 

Design



## **E-bus Opportunity is in Asia**







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- Economy comes from high utilization rate in both batteries and charging facilities
- Commercialization should start from upper-left corner





### Battery Swapping System – Taiwan

With swappable battery, Aleees e-bus can run 15 hours a day at 30~40 km/hr; and total mileage of 450~600 km. (swapping time excl.) Battery leasing and services are maintained by Aleees or 3<sup>rd</sup> party.

立調電 電動巴

Vehicle cost close to diesel bus



### **Aleees Leads Taiwan E-Bus Market**

#### **Comparing Aleees with other players:**

- Total bus on road 41, mileage
   1.1mn kilometers.
- Aleees the only one use batteryswap system.
- ✓ Highest % made in Taiwan.
- Receive highest satisfaction rate from users.







## **Taiwan E-Transportation Opportunity**

### **Taiwan Incentive Grant Program:**

Target to replace 6200 city buses within 10 years total incentive grand NTD 20bn E-Bus industry net worth NTD 100bn in 10 years

Unit/Year	1	2	3	4	5	6	7	8	9	10	Total
E-Bus	100	300	500	700	700	700	800	800	800	800	6200
Station	35	100	170	240	240	240	270	270	270	270	2105



宜蘭縣

花蓮縣

苗栗縣

南投縣

台東縣

台中縣

高雄縣

雲林縣

台南縣

◎嘉義縣

屏東點



### **Aleees China Opportunities**





Bonluck Bus in Nanchang City Yuyao City

In March, Aleees signed two Letter of Intent.

One was with Bonluck Bus, one of the 17 chartered new energy bus manufacturers in China.

And another one was with Yuyao city government.



## China E-Transportation Opportunity

#### China Incentive Grand Program: (Sept 2013)

New guidelines define New-Energy Vehicle as **pure electric vehicles**, plug-in hybrids and fuel-cell vehicles, leaving out the more conventional gas/ diesel-electric hybrids from the subsidy scope.

(10 meters and above bus, RMB)	New Guideline (2013~2015)	Old Guideline (2009~2012)
Pure Electric Bus	500K subsidy, KPI	500K subsidy, KPI
Plug-In Hybrid Bus	300K subsidy KPI	500K subsidy, KPI
Hybrid Bus	No sydsidy, KPI	500K subsidy, KPI
Natural Gas Bus	No subsidy, not 🔀 KPI	No subsidy, KPI
Fuel-Cell Bus	500K subsidy KPI	600K subsidy, KPI





### **China E-Transportation Opportunity**



#### China Incentive Grand Program: (Sept 2013)

- 12 out of 28 trial cities are considering using battery swap solution, instead of traditional charging system.
- Battery electric city-buses are eligible for up to
   500,000 RMB subsidy from central government.
- 3. Between 2013 and 2015, at least 10,000 new-energy vehicles should be deployed in each of the country's megacities and their neighboring regions, while other participating cities are set to deploy 5,000 units each during the same period.



4. 30% or more of government-purchased vehicles should be New Energy Vehicles.



## Swap vs. Charge

	Swap mode	Charge mode
System level identity	Close	Open
User Frequency	High	Low
Vehicle Routing	Fixed Route,	Random
	Regional	
Distance per trip (12M bus)	<100KM	>200KM
Distance per trip (8M bus)	<160KM	>200KM
Space Constraints	Little/No	High
Prevention of Failure	Strong	Weak
Down-time per Failure	Short (<2 hr)	Long (>7 day)
Battery Weight on a Bus	1.2 tons	3.0 tons
Operating Cost (assuming no battery	1.0X	1.4X
failure)		
Cost of Failure	Low	High
(failure-rate * down-time)		
Suitable for applications:	Short-to-med	Passenger car
	range bus	Gov/Corp car
	Motorcycle	
	Logistic truck	



## New Energy Buses Technology Comparison

Aleees' Battery-Swap E-Bus	Strengths : (1) No limitation on mileage. (2) Swapping battery in 6~10 minutes. (3) Completely solve air pollution problems. (4) Operational costs close to Diesel buses. (5) No need for government infrastructure, the operators owns the swapping station. (6) Low cost of ownership. Weaknesses: Limited by the area swapping stations covered.
Charge-Only E-Bus	<ul> <li>Strengths : (1) Low operational costs (2) No exhaust gas and PM2.5 pollution problems.</li> <li>Weaknesses : (1) Limited mileage (2) Night time high voltage charging requires load management from power plant. (3) Long charging time (&gt;8 hours). (4) Battery repair may require 14 working days. (5) Large investment on charging stations, but low efficiency.</li> </ul>
Hybrid Bus	Strengths : No need for infrastructure investment Weaknesses : (1) Limited fuel saving, (2) Battery repair / replacement may require as many as 14 days, (3) Transitional product lack of local support. <b>26</b>



## **Solid Shipment Record**

Cathode Material BU



**Electric Bus BU** 

China E-Bus

- a) Shipped 900 tons in 2013 and 1,157 tons in 2012.
- b) Still the largest shipment record in the world, but mild decline in 2013 as customers waiting on Chinese government's new energy policy.
- a) The only battery-swap system provider, guarantee to run 100km per charge.
- b) Diesel bus still enjoy heavy subsidy, little incentives for bus operators to replace diesel by electric bus yet.
- c) 10-year replacing 6,200 diesel buses policy on the way.
- a) SELL E-bus, battery and charging-by-swap station. Expecting to quickly generate revenues.
- b) In talks with local governments.

## **Historical Financials and Shipment Record**

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# New Energy Solution Can Be Self-Sustainable If It's Cost Approaches Traditional Solutions

#### **Thank you!**



# Appendix





## About Aleees (stock code: 5227)

- Date of Incorporation: 2005 Taiwan, 2007 Cayman Island
- Registered Capital : NTD1,420.7M (approx. NTD1,279.5M before IPO)
- IPO Date: 9<sup>th</sup> December 2013
- Total Number of Employees : 309
- Business Scope :

-LFP Cathode Material for Lithium Ion Battery

-Electric Bus Manufacturing, Sales; Battery Lease & Swapping Service Before IPO Shareholder structure :





### **Taiwan Bus Operators Entitlement**

### Replacing 6200 City Bus with NTD 20 billion Subsidy But yet to be finalized by Legislative Yuan

Item	Amount
Vehicle	NTD 3.75 million per car
Battery	NTD 500,000 per car battery
Charging Station	NTD 1 million per car
Route	NTD 1 billion



### Worldwide Patent Coverage

### 98 Various Patents Developed In-House

Materials, Process, Electric Vehicles and Battery-related Invention Patents

## 92 LFP and Material Patents Licensed

Cover Dr. Goodenough Patent, Carbon Coating and High-Voltage Material Patents



## **IP Issue and International Market**

1. Aleees filed 78 patents (31 granted, 47 pending)

#### 2. Licensed 85 LFP cathode material patents from LiFePO4+C Licensing AG

- 1). Licensor including HQ  $\$  Sud-Chemie  $\$  Montreal University  $\$  CNRS
- 2). Patent covers Dr. Goodenough's (UT) patent 🕤 Carbon-coating patent and high-voltage material
- 3). High voltage materials with appropriate anode will improve the battery life to 20,000 cycles
- 3. Licensed eight LTO anode material patents from HQ

Category	In-house Develop	Lice	Total		
	Materials and Processes	32	LFP cathode	49	
Granted Patents	Electric vehicles, and battery-related Invention patents	1	LTO anode	0	82
In Application	Material (Incl. process patents)	35	LFP cathode	43	116
	Electric Vehicles	30	LTO anode	8	
Subtotal		98		100	198



## Sub-Licensing, LiFePO4+C Licensing AG

	"LiFePO4+C" Licensees	Time (year)	Note
1	Süd-Chemie AG (100% owner of Phostech Lithium, Canada)	2008	Merged by Clariant (2011)
2	Aleees (Cayman)	2011 July	Industrial scale manufacturing
3	Tatung Fine Chemicals Co.	2011 July	Taiwan
4	Mitsui Engineering & Shipbuilding Co., Ltd.	2011 July	Japan
5	Sumitomo Osaka Cement Co., Ltd	2011 July	Japan
6	A123 Systems Corp.	2011 October	Acquired by Wanxiang
7	BASF Schwarzheide GmbH	2012 March	
8	The Prayon Group	2012 May	Global Leader in Phosphate



## LFP is Safe and Long-Life

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I	LiFePO4	LiCoO2	LiMn2O4	LiNiO2	NMC
Cathode Materials	LFP	LCO	LMO	LNO	NMC
Green?	Y	Y	Y	Y	Y
Patented?	Y	Ν	N	Ν	Ν
Operating Temperature	<300°C	<180°C	<180°C	<180°C	<180°C
Energy Density (mAh/g)	160 (theo. 170)	140-160 (theo. 275)	105-110 (theo. 148)	190-210	190 (theo. 278)
Cycle Life	>2000	>500	>500	> 500	>500
Advantage	Safety, Long Cycle-life	High energy density, Mature	Safer than LCO, High Power, Cheap	Highest Energy Density	High Energy Density
Disadvantage	Low Energy Density	Unsafe, Scarcity of Cobalt	Energy Density, Degrade at high temp.	Hard to make, Unsafe	Has all the disadvantage of Co, Ni, Mn



## Nominal vs. Usable Energy



Source: A123 presentation (2009 AABC)



### Solid and Long Term RD Investment



Year	2010	2011	2012	2013	3M2014
R&D Expenses (NT\$000)	60,243	117,569	108,977	150,482	50,896
	282,124	453,506	653,251	577,069	120,819
R&D Exp as % of Rev	21%	26%	17%	26%	42%



# Yearly P/L

NTD '000	2010	2011	YoY	2012	YoY	2013	YoY
Revenue	282,124	453,506	61%	653,251	44%	577,069	-12%
COGS	-227,561	-365,918	61%	-440,852	20%	-546,821	24%
Gross Profit	54,563	87,588	61%	212,399	142%	30,248	-86%
OPEX	-193,306	-439,534	127%	-399,375	-9%	-435,578	9%
OP Profit	-138,743	-351,946	154%	-186,976	-47%	-405,330	117%
Non-OP	-26,126	-8,030	-69%	-35,530	342%	-3,030	-91%
NPBT	-164,869	-359,976	118%	-222,506	-38%	-408,360	84%
Тах	-10,678	-743	-93%	-464	-38%	0	-100%
NPAT	-175,547	-360,719	105%	-222,970	-38%	-408,360	83%
EPS	-6.93	-3.63	-48%	-2.05	-44%	-3.36	64%

NTD	'000	2010		2011			2012			2013		
		Amount %	% Rev	Amount	% Rev	YoY	Amount	% Rev	YoY	Amount	% Rev	YoY
Sales		53,250	19%	187,429	41%	252%	175,638	27%	-6%	134,800	23%	-23%
SG&A		79,813	28%	134,536	30%	69%	114,760	17%	-15%	150,296	26%	31%
R&D		60,243	21%	117,569	26%	95%	108,977	17%	-7%	150,482	26%	38%



## Quarters P/L

NTD '000	1Q2013	2Q2013	3Q2013	4Q2013	1Q2014	
Revenue	102,100	204,131	146,527	124,311	120,819	
COGS	-78,127	-226,835	-119,533	-122,326	-118,848	
Gross Profit	23,973	-22,704	26,994	1,985	1,971	
OPEX	-93,016	-104,473	-113,746	-124,343	-124,412	
OP Profit	-69,044	-127,177	-86,752	-122,357	-122,441	
Non-OP	6,416	6,447	-9,256	-6,637	7,077	
NPBT	-62,628	-120,730	-96,008	-128,994	-115,364	
Тах	0	-1,764	0	1,764	0	
NPAT	-62,628	-122,494	-96,008	-127,230	-115,364	
EPS	-0.56	-1.08	-0.75	- 0.98	-0.81	