Green Banks and Financing Mobility, Storage and other Emerging Technologies
GREEN BANKS FINANCING MOBILITY, STORAGE AND OTHER TECHNOLOGIES

AJ JAUNCEY
6TH ANNUAL GREEN BANK CONGRESS
NOVEMBER 2018
OVERVIEW

MOBILITY & TRANSPORT

STORAGE

INNOVATIVE TECHNOLOGIES
THE NEW JONESES

- Solar PV
- Solar Panel Optimisation
- Energy Management Software
- Home Energy Management Software
- Behind the Meter Software and Hardware
- Battery
- Smart Grid
- EV Charging
- Energy Retailer
- EV

CEFC
Clean Energy Finance Corp.
MOBILITY & TRANSPORT
ELECTRIC VEHICLES IN AUSTRALIA

WHERE WE ARE HEADING

50% new purchases are EVs by 2030
5 minute supercharging
Matched driving range with non-EVs

WHAT WILL GET US THERE

POLICY INCENTIVES
MODEL AVAILABILITY
CHARGING NETWORK

WHAT WE WILL SEE

2 year payback on purchase price premium
20 EV models on the market in Australia by 2020
28,500 public access fast charging points
MOBILITY & TRANSPORT INVESTMENTS

AGGREGATION PARTNERSHIPS

CARBON REVOLUTION

RELECTRIFY
STORAGE

RATESETTER

HOME BATTERY SCHEME FINANCE

CEFC ROLE: Senior debt facility
COMMITMENT: $100 million
TRANSACTION DATE: September 2018
STORAGE

REDBACK TECHNOLOGY

SERIES A-2 EQUITY ROUND

CEFC ROLE: Investor
COMMITMENT: USD$5 million
TRANSACTION DATE: October 2017
INNOVATIVE TECHNOLOGIES

ARTESIAN CAPITAL

CLEAN ENERGY
SEED FUND

CEFC ROLE: Cornerstone investor
COMMITMENT: $10 million
TRANSACTION DATE: February 2017

THINXTRA

SERIES B
EQUITY ROUND

CEFC ROLE: Investor
COMMITMENT: $10 million
TRANSACTION DATE: August 2017
INVESTING IN INNOVATIVE TECHNOLOGY TO BETTER MANAGE ENERGY USE AND COSTS

SERIES A EQUITY ROUND

CEFC ROLE: Investor
COMMITMENT: $2 million
TRANSACTION DATE: August 2017
Session 1.2: Green Banks and Financing
Mobility, Storage and Other Emerging Technologies

Low Carbon Mobility

29 November 2018

SYED AHMAD SYED MUSTAFA
Acting Chief Executive Officer
GreenTech Malaysia
Increasing trend in motor-vehicle registration for all categories

- 26.3 million registered vehicles in 2015
- Vehicle population growth exceeded population growth rate

Transport sector – largest share of the final Energy consumption at 47% and 45% in 2014 and 2015 respectively
Quick glance to future, number of vehicles to keep growing

Estimated total of 52.3mil total vehicles at 2030. Car population itself will be double then 2015 level. Passenger vehicle to remain as number one emitter and energy consumer. Switching to other environmental friendly option is essential.

The simulation was done by TSSM for LCMB & AP study (on-going). The baseline data (BAU) used the Microfit statistical software to model the demand function of total vehicle volumes based on GDP growth rate.
Option for more environmental friendly options:

Potential EEV, from least to best option

### Conventional Internal Combustion Engine (ICE)
- Improved ICE:
  - Optimized Combustion (DVVT, Advance Cam Timing)
  - Electronic optimization (speed limiter, throttle response profile, acceleration profile)
  - Make use of some of excess energy and waste via super-charge and turbo-charge

### Hybrid
- Use of electric motor
- Energy recovery system
- Use of battery technology, small capacity
- Start-Stop System

### Plug-in Hybrid
- Full Electric drivetrain and ICE technology co-exist.
- Capable for external charging
- Energy Recovery System
- Smaller battery and electric motor compare to full EV
- Start-Stop System

### Electric Vehicles
- 100% Electric drivetrain.
- Rely on external charging only.
- Energy Recovery System.
- Start-Stop System (Permanent)
**2020**

Hybrid Electric Vehicle (HEV) global take-off point

By 2020, HEV (50% electric and 50% fuel) will dominate the market. 

Automotive manufacturer will mass produce HEVs and the market will offer Hybrid cars.

**2025**

Plug-in Hybrid Electric Vehicle global take-off point

By 2025, PHEV (70% electric and 30% fuel) is expected to be dominating the market and the landscape of the automotive industry will change significantly.

People will be charging their vehicles wherever chargers are available – at home, offices, car parks or rest areas. We will find that less cars will be going to petrol pump stations.

**Battery Electric Vehicle (BEV) + Fuel Cell Vehicle (FCV) global take-off point**

By 2030, EV (full electric vehicles - non emission powertrain technology) will dominate the automotive industry that most vehicles will be dependable on electricity or fuel cell.

Vehicles will no longer need to be charged at charging stations but charged by fuel cells which uses hydrogen. We will see a lot of hydrogen stations instead of fuel or petrol stations.

HEV, PHEV, BEV and FCV = e-Mobility

*Source: ASM Mega Science 3.0, 2016_Automotive Industry Sector*
LEADING NATIONS IN EV’S

E-Mobility Index – Ranking by indicator

<table>
<thead>
<tr>
<th>Technology</th>
<th>Industry</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>[China] 2.6</td>
<td>[China] 5.0</td>
<td>[China] 5.0</td>
</tr>
<tr>
<td>[Germany] 2.5</td>
<td>[US] 5.0</td>
<td>[US] 5.0</td>
</tr>
<tr>
<td>[Japan] 2.5</td>
<td>[Japan] 3.3</td>
<td>[Japan] 4.5</td>
</tr>
<tr>
<td>[South Korea] 1.6</td>
<td>[South Korea] 2.5</td>
<td>[South Korea] 3.9</td>
</tr>
<tr>
<td>[Italy] 1.2</td>
<td>[Italy] 0.7</td>
<td>[Italy] 1.7</td>
</tr>
<tr>
<td>Italy 0.2</td>
<td>France 0.0</td>
<td>Italy 0.9</td>
</tr>
</tbody>
</table>

Three individual indicators (Technology, Industry & Market) were weighted value ranges of 0-5 & combined to form the E-mobility Index

Source: Forschungsgesellschaft Kraftfahrwesen mbH Aachen; Roland Berger E-Mobility Index, Q2 2017
## NUMBER OF EV’S IN MALAYSIA

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TOTAL NUMBER OF REGISTRATIONS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hybrid</td>
<td>138</td>
<td>4,702</td>
</tr>
<tr>
<td>Electric</td>
<td>-</td>
<td>275</td>
</tr>
<tr>
<td>Total</td>
<td>138</td>
<td>4,977</td>
</tr>
</tbody>
</table>

**NOTE:** As at February 2018

**SOURCE:** ROAD TRANSPORT DEPARTMENT

*Total includes the number of electric vehicles.*
## OUR EXPERIENCE WITH EV

### GreenTech Malaysia EV Fleet:

<table>
<thead>
<tr>
<th></th>
<th>Renault Zoe</th>
<th>Mitsubishi i-Miev</th>
<th>Nissan Leaf</th>
<th>Tesla Model S 85</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Acquired date</strong></td>
<td>2014</td>
<td>2014</td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td><strong>Distance travelled (km)</strong></td>
<td>45,113</td>
<td>20,858</td>
<td>48,058</td>
<td>41,427</td>
</tr>
<tr>
<td><strong>Electricity consumption (kWh)</strong></td>
<td>4,749</td>
<td>2,781</td>
<td>8,286</td>
<td>8,814</td>
</tr>
<tr>
<td><strong>Electricity cost (RM)</strong></td>
<td>MYR 2,066</td>
<td>MYR 1,210</td>
<td>MYR 3,604</td>
<td>MYR 3,834</td>
</tr>
<tr>
<td><strong>Fuel avoidance (litres)</strong></td>
<td>3,383</td>
<td>1,564</td>
<td>3,604</td>
<td>3,107</td>
</tr>
<tr>
<td><strong>Cost savings - electricity vs fuel</strong></td>
<td>MYR 5,378</td>
<td>MYR 2,232</td>
<td>MYR 4,325</td>
<td>MYR 3,001</td>
</tr>
<tr>
<td><strong>Tailpipe Emission saving (T CO2)</strong></td>
<td>7.8</td>
<td>3.6</td>
<td>8.4</td>
<td>7.2</td>
</tr>
<tr>
<td><strong>Emissions from Electricity Consumption</strong></td>
<td>3.3</td>
<td>1.9</td>
<td>5.8</td>
<td>6.1</td>
</tr>
<tr>
<td><strong>Net Emissions Reduction (Ton CO2)</strong></td>
<td>4.6</td>
<td>1.7</td>
<td>2.6</td>
<td>1.1</td>
</tr>
<tr>
<td><strong>Maintenance cost</strong></td>
<td>MYR 1,412</td>
<td>MYR 770</td>
<td>MYR 570</td>
<td>MYR 15,950</td>
</tr>
</tbody>
</table>

**Data & Assumptions:** Based on fleet database in GreenTech Malaysia (as at June 2018), standard petrol car fuel consumption 7.5 litres/100km, fuel price RN95 MYR2.20 per litre, CO2 emissions 174 g/km, zero tailpipe emission, electricity tariff commercial B MYR0.43 per kWh.

**Facts:**

2. Energy mix in Malaysia is taking in more RE, target at 20% by 2025. Future emission factor for electricity generation will be further improved.
CHARGING INFRASTRUCTURE

Enabling EV ownership; overcoming the range anxiety barrier

245 ChargEV installed (as at Oct 2018)

Hotels, shopping malls, office buildings, hospitals, community hub, condominium, municipality building, sports complex, and R&R.

Subscribed by > 5000 users (mostly PHEV)
Data collection and user-behavior analysis:

**Shopping Mall** – Average charging time is 2.5 hours with 6 – 7 kWh per session. Highest usage frequency. Certain locations have shortage of charging points.

**Condominium** have long average stay time indicating mostly overnight charging.

**Petrol stations** have shorter average stay time with less kWh drawn. Lower usage frequency.

The trend is reflecting EV charging pattern (public facility) is done alongside daily activities. This data also to predict the impact and enable predictability for electricity grid.
Green Bank Congress

Green Banks and Financing
Mobility, Storage and other
Emerging Technologies

U.S.-China Green Fund
November 29, 2018
Mission: Greenergize China through innovative investments and U.S.-China cross-border collaborations in finance, green technologies, and business models.

**Tackle**
China’s environmental pollution and reduce emissions

**Obtain**
Policy and capital support in China market

**Improve**
U.S.-China bilateral relationship

**Introduce**
Advanced U.S. technology and resources to China

**Create**
Green jobs and growth in U.S. and China

**Vision**
To become the best-in-class green equity fund and the commercial implementer of U.S.-China green collaboration.
RMB PE Fund’s investments are focused on four main sectors

- Investment criteria based on market performance, sustainability standards, and “P.R.I.M.E.” model.
- Invest in leading Chinese platform companies, creating viable channels for advanced green technologies to identify local markets and commercialization opportunities.
- Fund I already invested more than $420 million and has a pipeline of deals totaling $1.2 billion.

**“Invest • Greenergize China” : Focus on the Theme of New Urbanization**

- **Green Consumption**
  - Commercial & Residential
  - Smart, Efficient Buildings
  - Rural Market Revitalization & Sustainable Ag

- **Green Mobility**
  - Smart Parking & Charging Stations
  - Smart Logistics

- **Green Energy**
  - Distributed Energy & Clean Heating Power
  - Energy IoT

- **Green Manufacturing**
  - Green Supply Chain
  - Water and Solid Waste Treatment & Processing
## RMB PE Fund Portfolio companies and special purpose platforms

### Green Consumption

<table>
<thead>
<tr>
<th>Company</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>East Low Carbon</strong></td>
<td><em>provides energy performance contracting services and upgrades to luxury hotels, hospitals, industrial facilities, data centers, and supermarkets (100+ projects completed)</em></td>
</tr>
<tr>
<td><strong>Changcheng Property</strong></td>
<td>an independent property management company with 750 properties creating green smart communities and eco-friendly properties.</td>
</tr>
<tr>
<td><strong>Hos Joy</strong></td>
<td>provides comprehensive smart and energy efficient O2O home improvement services including HVAC, heating, air and water purification, and green energy upgrades (300,000 households served)</td>
</tr>
<tr>
<td><strong>New Starting Point</strong></td>
<td>provides green blue-collar apartments to urban service workers through business model innovation and energy-saving retrofits</td>
</tr>
<tr>
<td><strong>Huitongda</strong></td>
<td>provides enhanced services to rural villages through an O2O platform of 90,000 mom-and-pop stores and empowers local entrepreneurs to sell green products (GMV 200 billion)</td>
</tr>
</tbody>
</table>

### Green Energy

<table>
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<tbody>
<tr>
<td><strong>Capital Heat</strong></td>
<td>recovers waste heat from power generation and transmits heat through distribution network to provide residential district heating</td>
</tr>
<tr>
<td><strong>Green Liquid Sunshine Fund</strong></td>
<td>invest in methanol and ethanol projects in the U.S. and China to facilitate green fuel and chemicals</td>
</tr>
<tr>
<td><strong>Planned Investments:</strong></td>
<td><em>Smart Energy and Heating Company:</em> improves energy network efficiency and intelligence using IoT technology and big data analytics</td>
</tr>
</tbody>
</table>

### Green Manufacturing

<table>
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</thead>
<tbody>
<tr>
<td><strong>Green Supply Chain</strong></td>
<td><em>provides integrated energy efficiency and green enhancement services to companies’ supply chain vendors</em></td>
</tr>
<tr>
<td><strong>CoolTera</strong></td>
<td>enhances data center energy efficiency using liquid cooling technology</td>
</tr>
<tr>
<td><strong>Four Rivers Steel Restructuring Fund</strong></td>
<td>steel industry restructuring and green upgrades with BaoWu Steel, China Merchants Group, and W. L. Ross</td>
</tr>
<tr>
<td><strong>Xiandou Recycling</strong></td>
<td>Xiandou Recycling is an O2O recycling service platform focused on enterprise-level trash and renewable resource recycling</td>
</tr>
</tbody>
</table>

### Green Mobility

<table>
<thead>
<tr>
<th>Company</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Alpark</strong></td>
<td><em>utilizes 4th generation city-level (indoor + roadside) smart parking technology to address parking and traffic congestion problems and mitigate CO₂ emissions</em></td>
</tr>
</tbody>
</table>
Case Study 1: Alpark

Alpark is the world’s first company to develop image recognition + artificial intelligence technology to solve the difficulties of urban parking. The company brings together a group of advanced teams, builds the world’s leading intelligent parking technology and operating system. It has developed over hundreds of Internet big data hardware core technology and patent with independent intellectual property rights.

**Founder**

**Dr. Yan Jun**
- Alpark Chairman & CSO
- EMBA, Guanghua School of Management at PKU

**Achievement**

- Alpark Sky Eye
- Alpark APP
- Alpark City
- Alpark One

**Prospects**

Through an innovative "Internet + AI" model, realize the goal of one APP to connect cities, countries, and the world, driving a new era of “green travel, smart parking, and better life” for global drivers.

**Development**

Fourth-generation intelligent parking technology to manage city-wide parking systems

**Collaboration**

U.S.-China Green Fund’s investment helps with technological transformation, operational upgrades, and the development of a seamless system to improve parking space efficiency, alleviate congestion, and reduce CO2 emissions.
Case Study 2: East Low Carbon

East Low Carbon (ELC) is a leading energy servicing company in China that provides holistic solutions and capital to help energy-intensive facilities such as five-star hotels, hospitals, urban complexes, and industrial plants reduce their energy consumption. To-date it has successfully completed 60+ energy savings projects including collaborations with Shangri-La, IHG, and Hyatt Hotels.

Founder

**Dr. Long Shengping**
- Co-Chairman and CEO of ELC
- Professor, East China Normal University
- Director, Energy Savings and Environmental Protection Professional Committee, Shanghai Building Technology Research Association

Development

With the help of the Technology Research Institute, it has integrated supply chain, technical solutions and platforms

Prospects

Committed to becoming the “energy solutions partner” to governments, hospitals, schools, businesses, industry, and large corporations

Collaboration

U.S-China Green Fund has become the majority shareholder of East Low Carbon.

Achievement

- 100 Energy saving projects
- 10 mil Reconstruction areas
- 20 Energy savings rate

2012 2016 2017 2017 2018
Green Manufacturing: Green Supply Chain – ELC

By collaborating with GE on formulating comprehensive energy efficiency solutions, East Low Carbon executes on energy efficiency and environmental upgrades to achieve optimal solutions and sustainable growth for our supply chain partners.

Supply Chain Partners

Integrated Energy and Environmental Optimization Solutions

Technical Partners

New Factories

Existing Factories

All Suppliers

Energy Efficiency Designs
Incorporate cutting-edge clean tech and energy efficiency solutions into a comprehensive energy-saving plan for the design and construction of new factories across GE’s global supply chain

Energy Management Contracting
Provide existing suppliers with Energy Management Contracting (EMC) service to replace outdated manufacturing components and reinforce the efficiency of suppliers energy in sustainability

Comprehensive Energy Management Services
Deliver all-inclusive professional energy management services, including the purchase, operation, and management of comprehensive clean tech solutions, to enhance persistently efficient energy performance
Address: Suite 4908, China World Tower B
No. 1 Jian Guo Men Wai Avenue
Chaoyang District, Beijing 100004
Tel: +86 10 8540-6200
Website: www.uschinagreenfund.com
上 汽 安 悦
悦你 悦我 悦世界 创新 创业 创未来
成立背景

世界500强企业第41名

上海上汽安悦充电科技有限公司

充电设施、光储充系统、
智能停车系统、广告传媒

成立时间

2015.10.28

注册资金

¥ 300,000,000

上海安悦节能技术有限公司

新能源、节能、环境、
智能、运维

成立时间

2010.10.18

注册资金

¥ 50,000,000
自安悦节能公司2010年成立以来:

- 已实施各类节能环保项目近 1000 个
- 建成光伏电站超 200 兆瓦
- 每年发电量超过 2.2 亿度
- 减少二氧化碳等有害气体排放约 70 万 吨
- 累计为业主节约各类能源费用数 亿元
自安悦充电公司2015年成立以来：

- 累计投放充电桩逾 11万 根
- 累计投放总功率约 80万 KW
- 上海地区公共桩投建占比达 40%
- 全国充电运营商位列 前五
安悦节能

节能

为各种工业生产及民用建筑提供蓄冷蓄热、余热余压回收利用、高温热泵、电力蓄能、压缩空气系统节能等一系列的节能解决方案

智能

提供能源管理平台、光伏运维平台、环境监测平台的定制化服务

新能源

致力于成为提供光伏电站融资、开发、设计、建设、运维一站式解决方案的绿色能源供应商

运营

提供光伏智能运维服务、站房智能化管理与设备智能化维保的整体运维解决方案

环境

致力于为企业提供环境咨询、环境监测、三废处理等完整的闭环服务
一座箱式变电站；两座设备集装箱（智能柔性充电堆、光伏42KW、储能100KWh）；一座光伏车棚；一座立体车库（3×7+1×8）；3根60KW双枪直流充电桩、5根7kW回形针交流充电桩。整个系统采用251KWh的三元锂电池，3.7V94AH180串4并，主要用于园区削峰填谷。系统按照实现分布式发电利用储能系统可最大限度的就地消纳并可以离网独立运行的原则进行了设计，有两种运行方式：并网运行和孤岛运行两种模式。1.由分布式电源（微风发电1KW*2/光伏屋顶21.6kw）、储能装置（汽车退役动力电池标称容量105KWh）组成的光储充系统。2.花园坊1000KWh削峰填谷储能电站，根据园区稳定用电负荷情况，结合控制策略为园区削减MD值。
电池梯度利用
- 4S店
- 修理厂
- 报废厂
- 其他集中回收站点

电池梯度利用处理
- 检测分选
- 重组重包
- 梯度利用产品生产

产品应用及销售
- 集中式储能电站
- 分布式储能电站
- 叉车、高尔夫球车等
- 通讯基站

电池资源化再利用

确定回收频次、职责分工、回收费用等
制成梯度利用电池产品
直接销售的需要与经销商进一步确认回收处理方案

电池回收

电池梯度利用

电池资源化再利用
贯彻上汽集团“新四化”战略思想
研发生产、投资建设、运维管理为一体的充电服务供应商
助力出行服务的绿色生态产业链

运营目标：2020年，在全国投放66万根充电桩
平台目标：最佳客户体验的充电服务平台
产品目标：最具竞争力的充电产品供应商

定位与目标
充电服务板块 -- 专用场站建设

临港大道枢纽站
- 上海第一座采用240kw双枪直流快充的公交充电场站
- 总装机功率 1440 KW

东门充电站
- 将配备35根直流桩
- 总装机功率 3060 KW
- 可同时为70辆新能源公交车提供充电服务

成山路充电场站
- 占地100300平方米
- 本期总装机功率 9300 KW
- 可服务至少248辆公交车
- 亚洲最大室内公交停车场

大众出租车场站
- 本期规划建设场站2座
- 本期预计总装机功率 2800KW
- 规划建设63个充电车位

露虹充电站
- 总装机功率 6420 KW，配备8000KVA变压器及800KVA箱式变压器各一个，充电终端111个。
- 可同时为160辆大巴车提供充电服务
- 专用场站，社会共享
产品制造板块

- 荣威 II 系列

荣威 eRX5 混动
最大输出功率：7KW
最大输出电流：32A

荣威 ERX5 纯电动
最大输出功率：7KW
最大输出电流：32A

交流慢充桩
直流快充桩

平湖生产基地

- 占地36亩，建筑面积35,000平米
- 按照IATF16949/VDA6.3质量管控体系打造
- 规划10条交流、6条直流智能自动化产线
- 科创中心拥有各类实验/测试设备43台套
- 当前年产量10万台套，目标年产量100万台套
THANKS
谢谢观看
Green Banks and Financing Mobility, Storage and other Emerging Technologies

Questions & Discussion

Sixth Annual Green Bank Congress