



EcoPartnerships: A model for U.S. – China Energy Collaboration

**Tianjin Lishen Battery Joint-Stock CO., LTD.
and
The U.S. – China Collaboration Platform**

**David Fleshler, Associate Provost for International Affairs, Case Western
Reserve University 西储大学国际事务处副教授长**

**QIN Xingcai, President of Tianjin Lishen Battery Joint-Stock Co., LTD.
秦兴才，天津力神电池股份有限公司总裁**

The Partners:

China National Off-shore Oil Co. New Energy Investment Co., Ltd.



Wholly-owned subsidiary of China National Off-shore Oil Co. (CNOOC), a State Owned Enterprise, 3rd largest oil and gas company in China with sales revenue of 354.8 billion RMB (2010). Total assets of the CNOOC – NEI were 7.82 billion RMB with over 560 employees (2010).



In charge of centralized management of CNOOC new energy businesses. Primary businesses include wind energy, coal-based clean energy, biomass energy, renewable energy such as power batteries, and clean energy development and utilization.



The Partners:

Tianjin Lishen Battery Joint Stock Co., Ltd.

 Established: Dec. 25, 1997

 Investments:

- Registered Capital: \$ 192 Million USD
- Total Asset: \$ 923 Million USD

 Main Shareholders:

- China National Offshore Oil Corporation
- SDIC Hi-Tech Investment Co., Ltd
- Tianjin Lantian Power Sources Co., Ltd

 Employee Composition:

- Total employees: 6000/ 2000 engineers

Lishen is a world class quality, technology Li-ion Battery company, is Top 5 Li-ion battery supplier in global market share, is one of main participants in Chinese MOST 863 EV & HEV Advanced Battery Program, and is the leader for EV battery of central enterprises electric motor alliance in China



The Partners:

Case Western Reserve University

 Comprehensive Science and Technology Focused University: College of Arts and Sciences, School of Engineering, Mandel School for Applied Social Sciences, School of Dental Medicine, School of Law, School of Medicine, School of Nursing, Weatherhead School of Management

 4,227 undergraduates ; 5,610 graduate and professional students

 External Support for Research: \$ 385.7 million (2009-10)

 Ranked 13th in the nation among private institutions in federal expenditures for science and engineering research and development and in the top 20 among private universities for overall federal research funding (2008)



Development of the U.S. – China Collaboration Platform

- Jan, 2010** CWRU and CNOOC-NEI were connected by Ministry of Science and Technology
- Mar, 2010** Mr. David Fleshler, Associate Provost of International Affairs and CWRU representatives visited China
- May, 2010** Dr. Xiao Gang, CNOOC-NEI Chief Scientist visited CRWU
- May, 2010** Dr. YeFan Wang Glavin was engaged to advise and begin planning for the “Collaboration Platform”
- June, 2010** Dr. Wang Glavin initiated discussion with U.S. Department of State
- Sep, 2010** CWRU and CNOOC-NEI signed a Memorandum of Understanding
- Oct, 2010** Mr. Fleshler and CWRU representatives met with the U.S. Department of Energy officials
- Oct, 2010** Dr. Wang Glavin met with National Development and Reform Commission officials
- Nov, 2010** Dr. Xiao and Dr. Wang Glavin met with US Department of Energy representatives in China
- Jan, 2011** Drs. Xiao and Wang Glavin met with National Development and Reform Commission and the Ministry of Science and Technology officials



中美战略经济对话
U.S.-CHINA STRATEGIC ECONOMIC DIALOGUE

U.S.-CHINA STRATEGIC ECONOMIC DIALOGUE



“US – CHINA COLLABORATION PLATFORM”

APPROVED BY THE US STATE DEPARTMENT AND CHINA NATIONAL
DEVELOPMENT AND REFORM COMMISSION AS AN

“ECOPARTNERSHIP”

ANNOUNCED IN THE JOINT STATEMENT BY PRESIDENTS OBAMA AND HU
JANUARY 2011, WASHINGTON D.C.

“US – China Collaboration Platform”

On May 10th 2011, Secretary of State Hillary Rodham Clinton and China's National Development and Reform Commission Deputy Director Xie Zhenhua presided and spoke at the Memorandum of Understanding signing ceremony in the US Department of State.



What is an EcoPartnership?



National Framework: Pursuant to the Framework for the Ten Year Cooperation on Energy and Environment between the Government of the United States of America and the Government of the People's Republic of China signed on June 18, 2008.



Purpose: EcoPartnerships are established to advance energy security, economic growth, and environmental sustainability, and address climate change, by encouraging voluntary, cooperative partnerships at the sub-national level.





Highlights of the Collaboration

To develop **technically feasible** and **economically viable** solutions to pressing energy and environmental issues by accessing the **most promising technologies, research, knowledge and talent** in the U.S., China and worldwide.



Support the exchange of ideas and people



Further capacity building and foster innovation



Encourage bilateral sustainable economic development



Provide a collaborative U.S. – China base to study, test and implement energy and environmental solutions



Highlights of the Collaboration

 The Collaboration Platform will allow CNOOC-NEI, Lishen and CWRU to work together directly, but, importantly, **the platform is also designed to bring the best institutions – universities, industry, non-profits and others – to the Platform to help find solutions.**

 The Initial Proposed Projects: Clean use of fossil fuels, carbon dioxide capture, utilization and storage (CCUS); **battery and electrical vehicle technology**; offshore wind energy development; shale gas development; energy storage and distribution; ocean energy technologies and fuel cell technology.

 Expansion of Network

- Technology (Argonne NL, LBNL, NREL, etc.)
- Policy (NDRC, MOST, DOE, DOS, etc.)
- Quality and Standards
- Market and Investment



Strengthen Collaboration, and Co-Development

**Qin Xingcai
President**

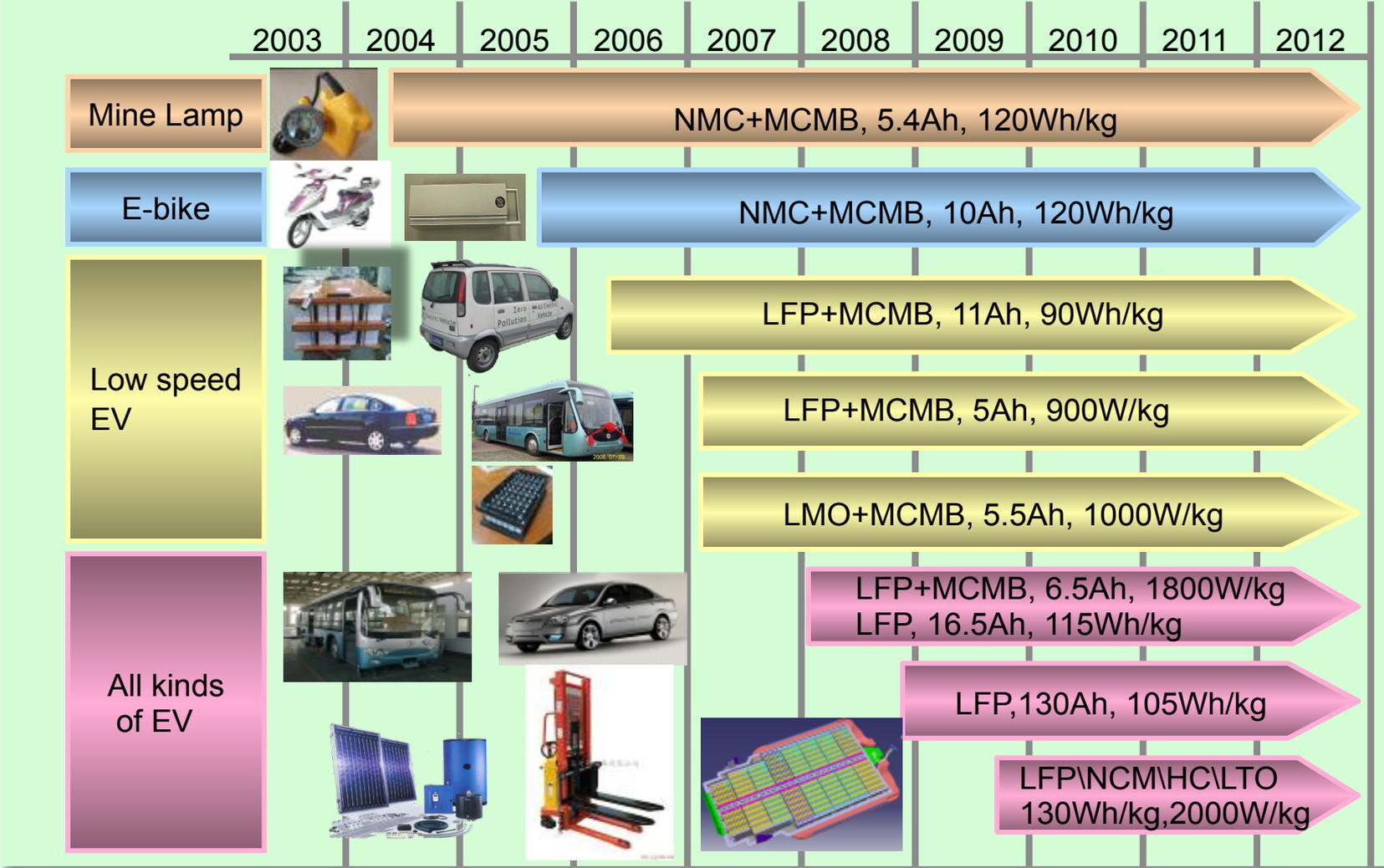
Tianjin Lishen Battery Joint-Stock Co., Ltd.

Content

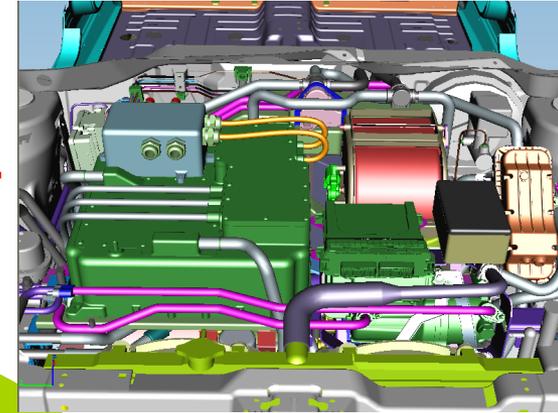
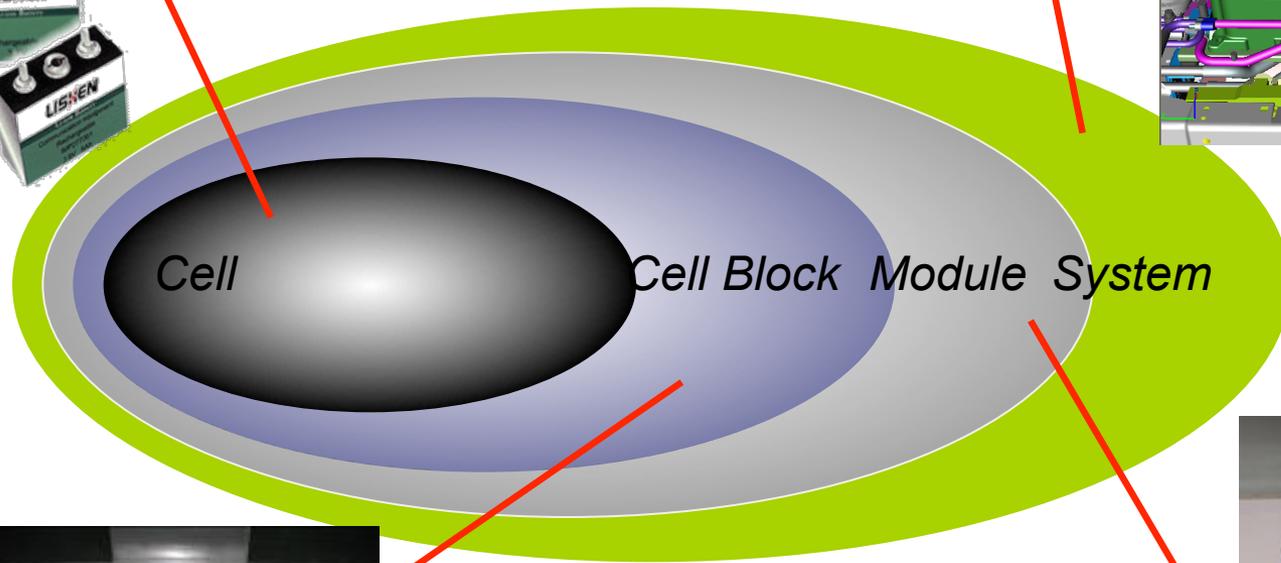
- Lishen's Advanced Li-ion battery Technology and Application in EV & ESS
- Lishen's Development Roadmap
- Cooperation Projects in US

Lishen Current Li-ion Power Battery Technology

Lishen is one of main participants in Chinese MOST 863 EV & HEV Advanced Battery Program for 10 years.

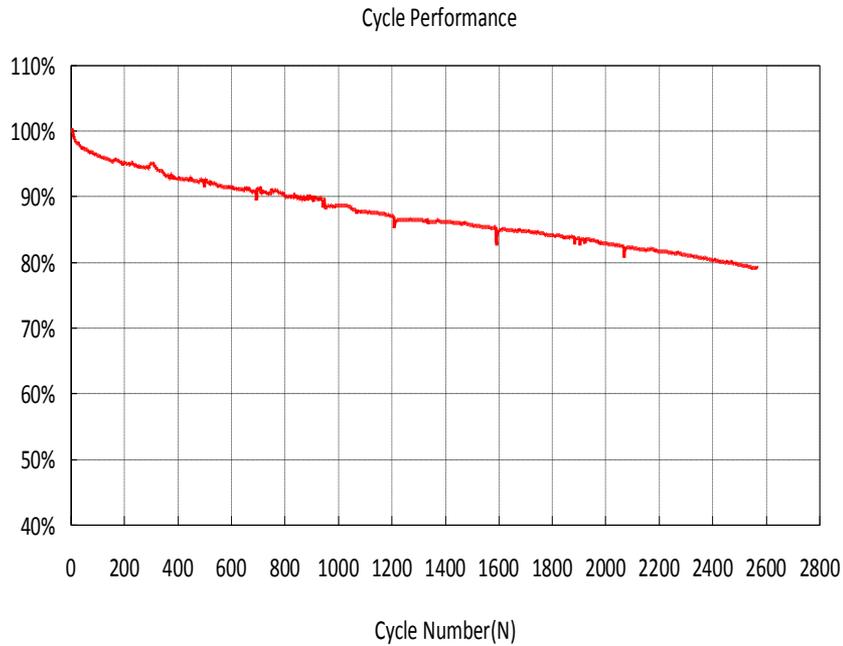


Li-ion Battery Technology From Cell to Pack System

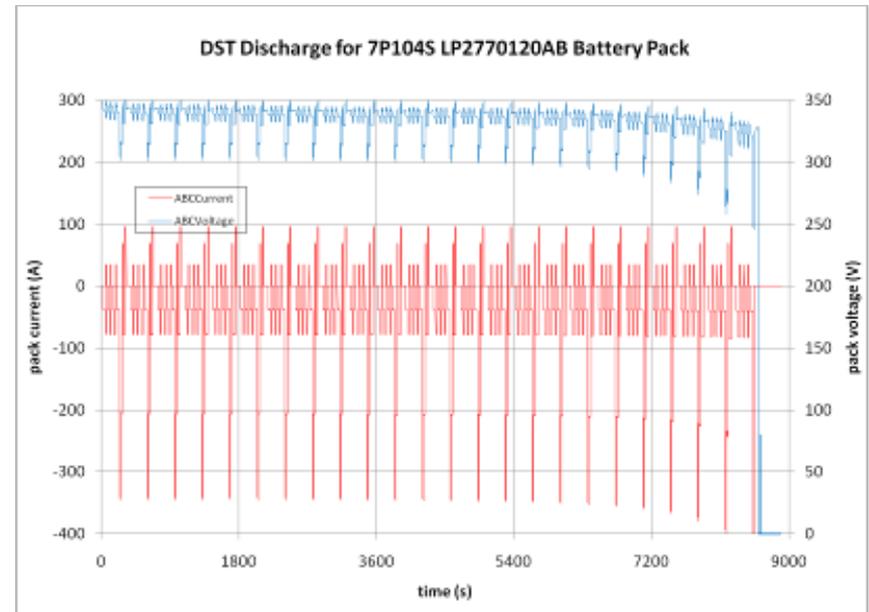


Lishen Current Li-ion Power Battery Technology

System Cycle Life



System DST Testing



Efficiency; 97%

Note: Dynamic Stress Test

Content

- ❑ Brief Introduction of Lishen Company
- ❑ Lishen's Advanced Li-ion battery Technology and Application in EV & ESS
- ❑ Lishen's Development Roadmap
- ❑ Cooperation Projects in US

Lishen EV Advanced Battery Development Roadmap

What Factors We Care About for EV Application?

Necessary:

Safety ;

Reliability (vibration and Shock) ;

Rate Ability;

Temperature Performance(-20 to 60C degree);

Long Calendar Life (10-15 Years);

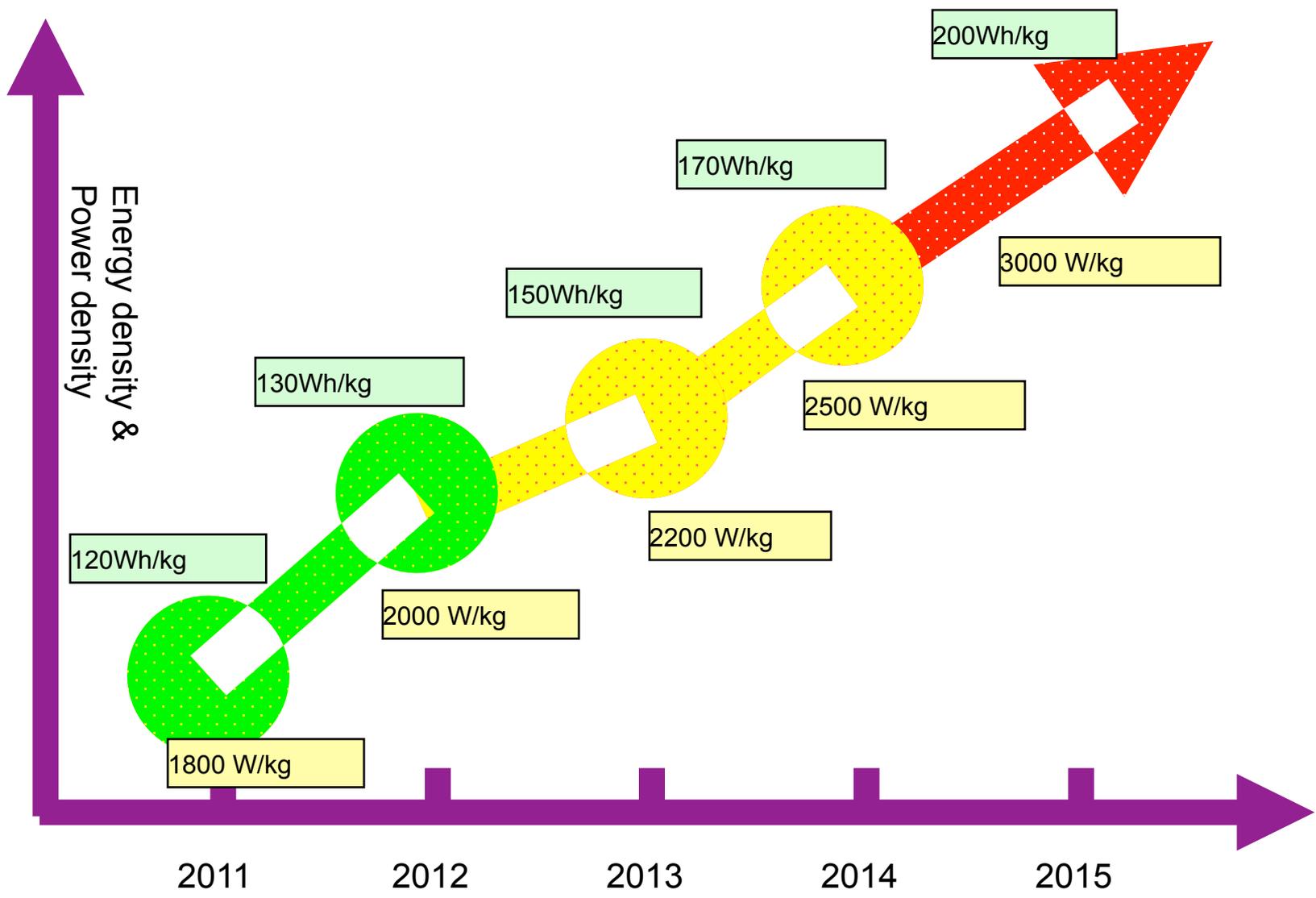
Long Cycle Life (150-200K Km).

Competitive:

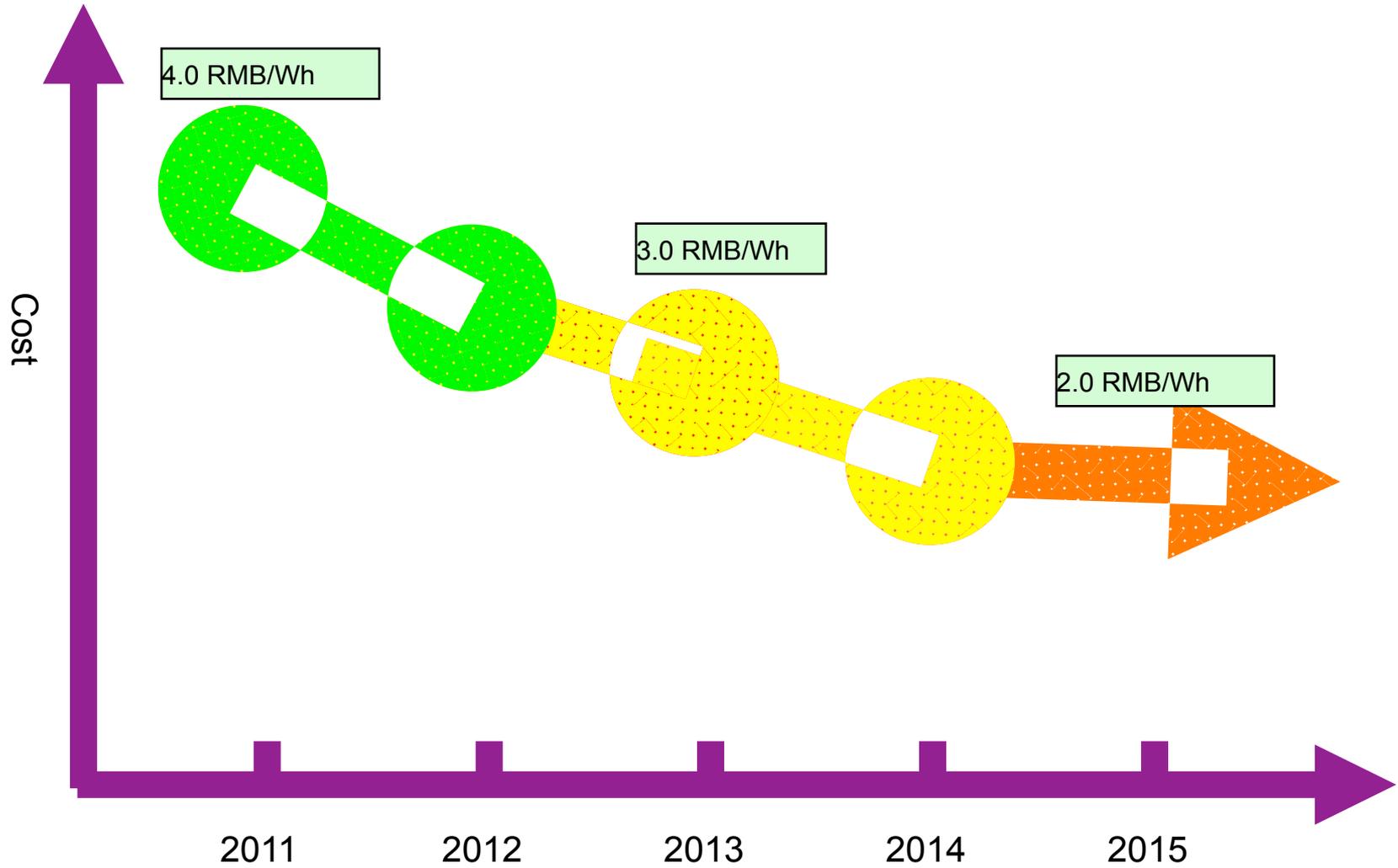
Energy Capacity Density;

Cost.

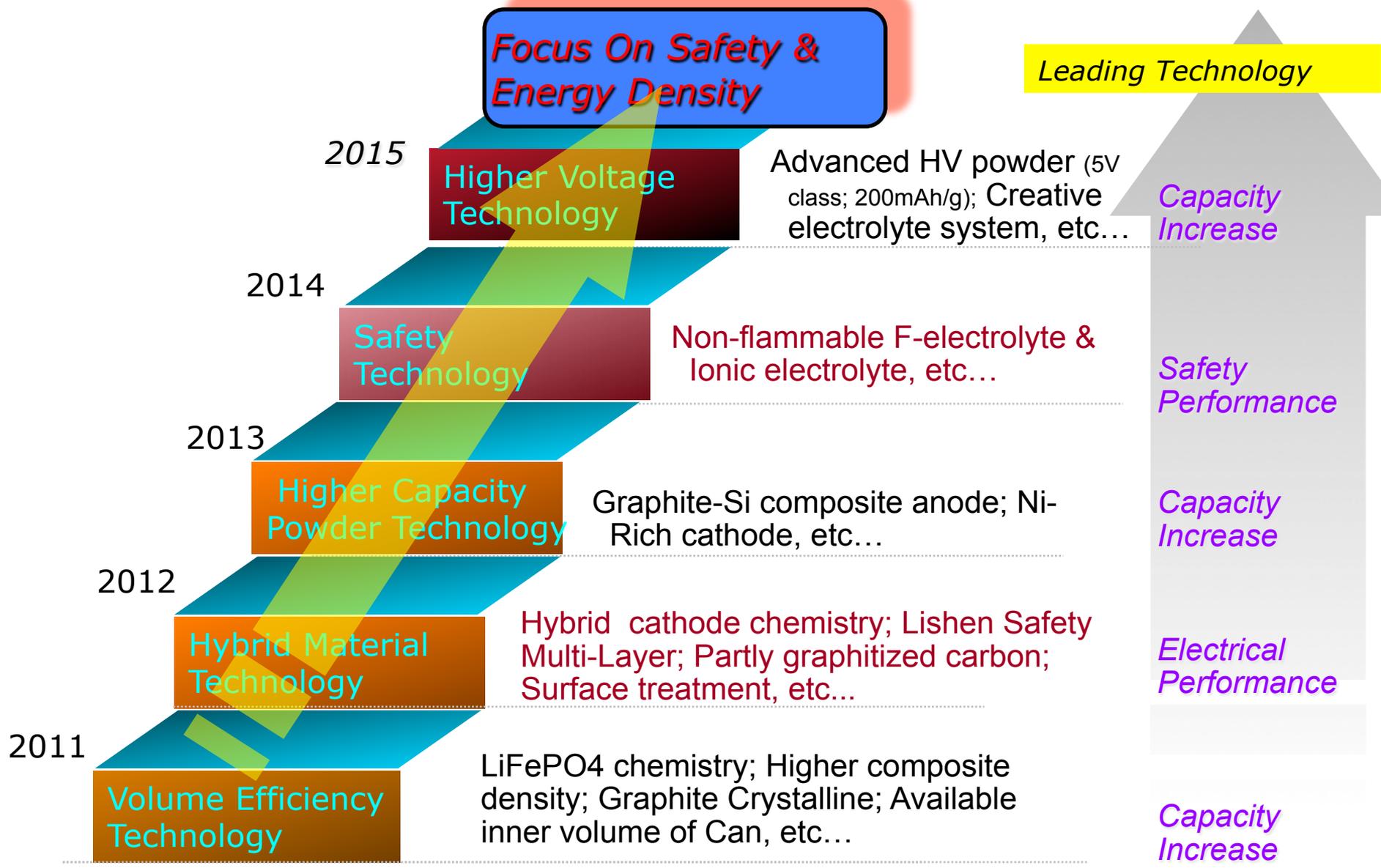
EV Energy & Power Density Roadmap



Cost Down Roadmap for EV Application



EV Advanced Battery Technology Roadmap



Lishen ESS Advanced Battery Development Outlook

What Factors We Care About for ESS Application?

Necessary:

Safety ;

~~Reliability (vibration and Shock) ; Rate~~

~~Ability(3C rate); Temperature Performance(-20 to 60C degree);~~

Long Calendar Life (15Years);

Long Cycle Life (~3000 times).

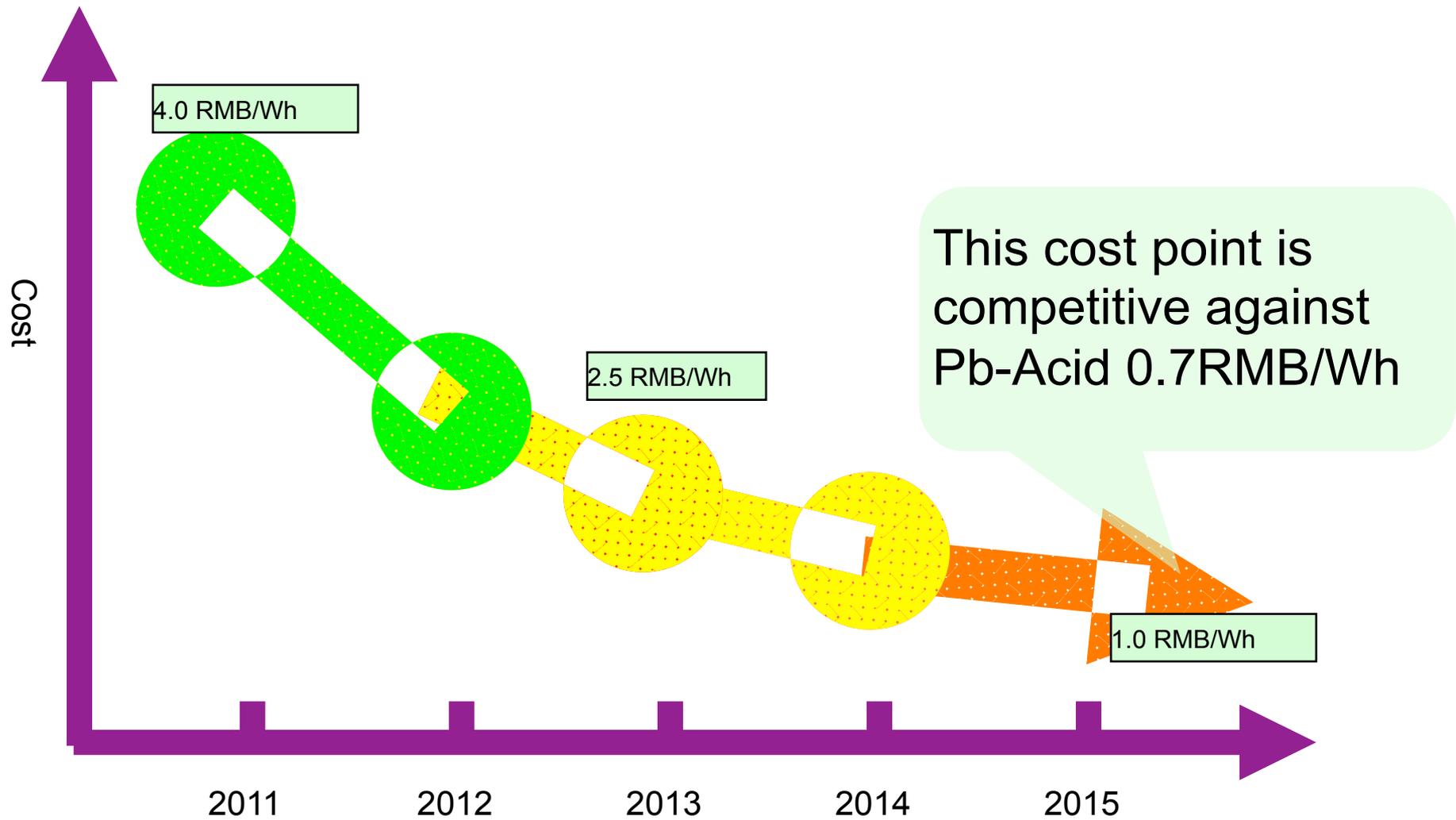
Competitive:

Energy

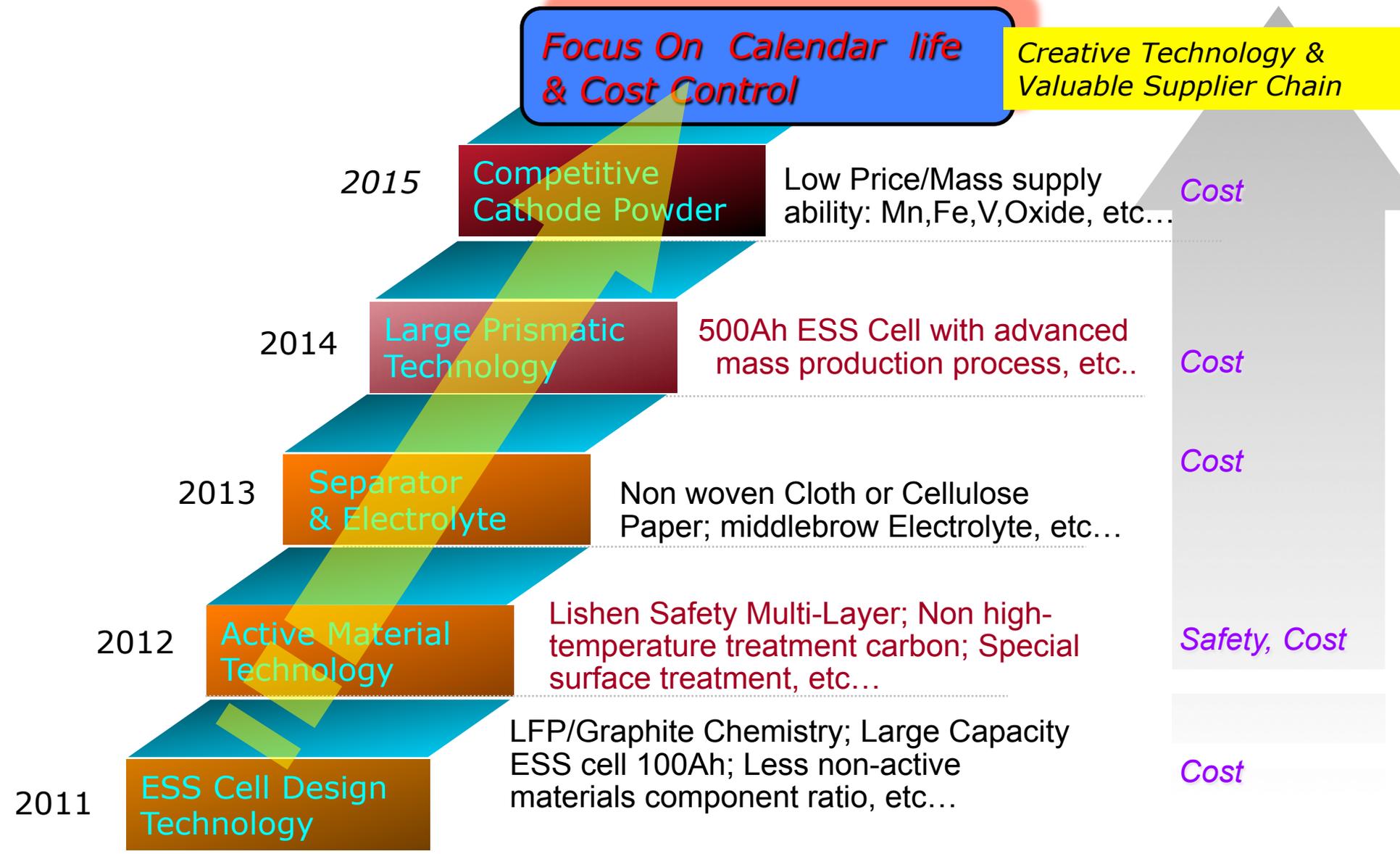
Capacity Density;

Cost.

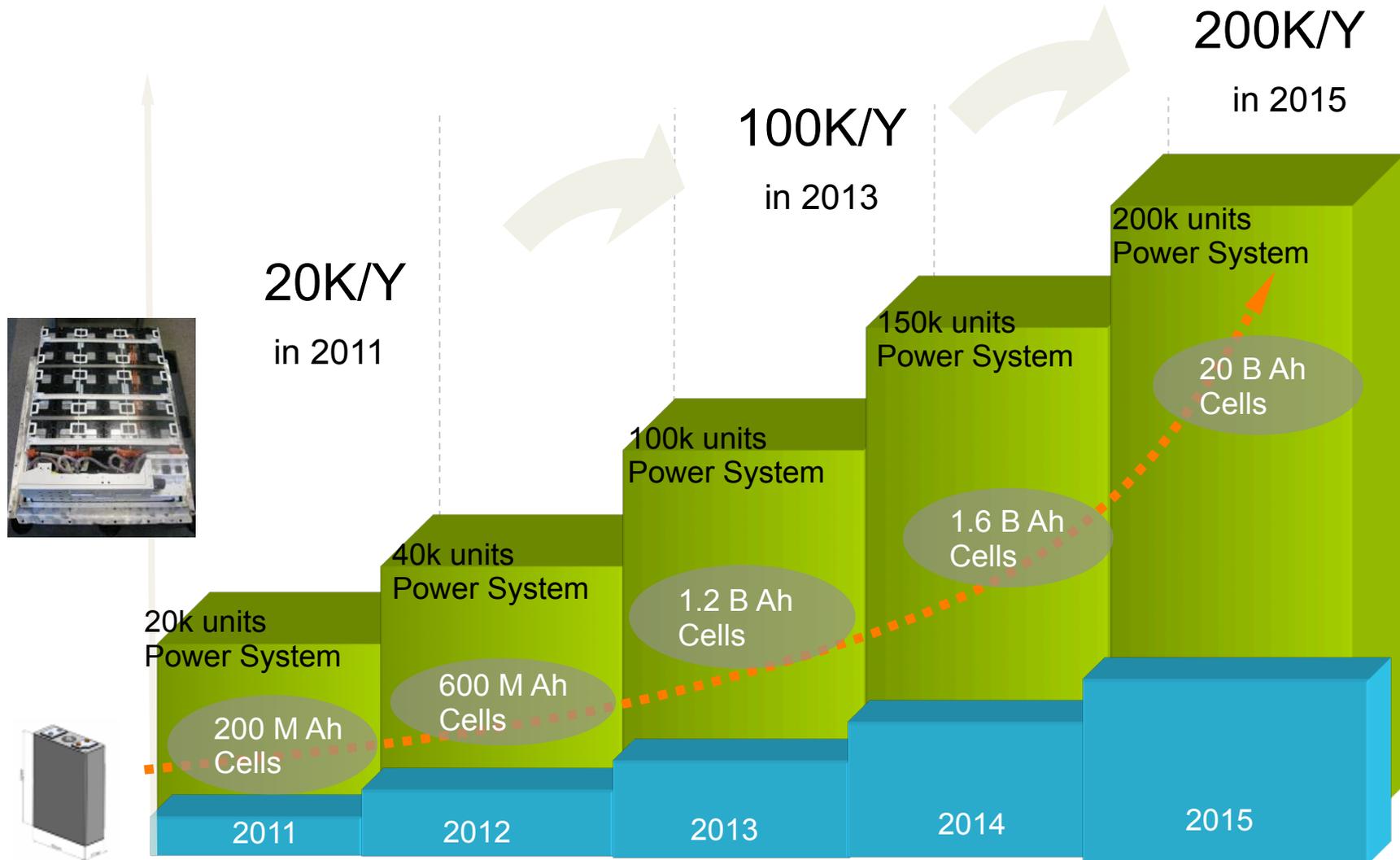
Cost Down Roadmap for ESS Application



ESS Advanced Battery Technology Roadmap



Lishen Production Development - Power LIB



Content

- ❑ Lishen's Advanced Li-ion battery Technology and Application in EV & ESS
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- ❑ Cooperation Projects in US

Cooperation with CODA



Coda EV

Performance

Battery Pack : 35kWh

Vehicle range: 90-120 miles (US 06 & UDDS)

Top Speed: 80 mph (Electronically Limited)

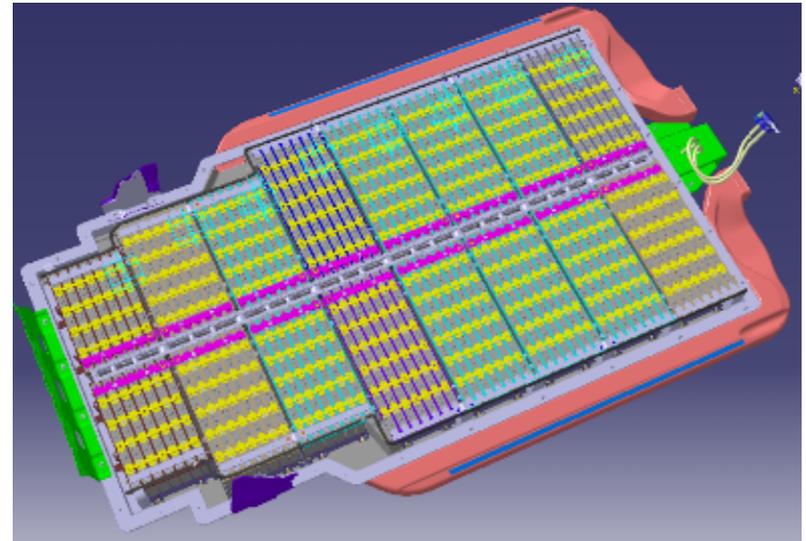
Acceleration: 0-60 mph - under 11 seconds

Charge Time: 6 hours from 220V (30AMP)

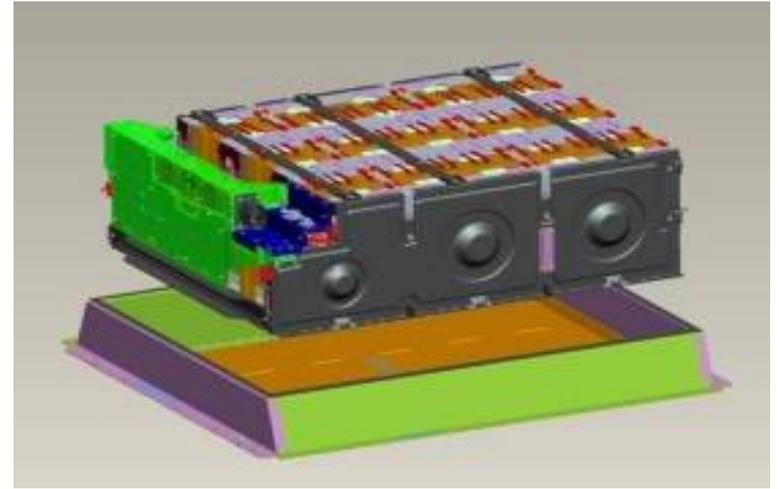
Occupancy: 4 passengers

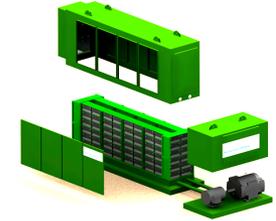
Vehicle Warranty: 3 years / 36,000 miles

Battery Warranty: 8 years / 100,000 miles



Cooperation with ATIEVA/SINOEV etc.





LISHEN BATTERY 力神电池

Cooperative Partnership 合作伙伴关系

DEMAND ENERGY 力马能源

- Battery & Batt Mgmt System (BMS)
电池及其管理系统
- Leader in Lithium Battery Dev. 锂电池发展的领导者
- Cell phone & PC supplier 手机和个人电脑供应
- Electric Vehicle Battery Design 电动车电池设计
- Power battery development 动力电池的发展
- Solar panel production 太阳能电池板生产
- Long Cycle Life/High Quality LFP
循环寿命长/高品质的磷酸锂铁



- Power System Design 电源系统设计
- Network System Design 网络系统设计
- Power Conversion System 电力转换系统
- AC panel, onboard meter and speed control
交流面板，仪表板和速度控制
- Software – component management
软件-组件管理



Solar Charged Energy Storage System

使用太阳能充电的储能系统

- ❖ Lishen PV Panels 力神光伏板
 - ❖ 120 Panels
 - ❖ 235 W/ Panel- 28.2 kW
 - ❖ Direct Connect Battery Charge Controller DC/DC
- ❖ Lishen Battery system 力神电池系统
 - ❖ 4608 3.2 V / 12.5 AH Lithium Ion Power Cells
 - ❖ Operating Range 80%-20% DOD-
- ❖ Demand PCS & System Software
Demand 的电力控制系统及软件
 - ❖ 25 kW Motor/Gen set
 - ❖ 110.00 kWh / 25 kW= 4 Hours Supply



"DEMAND SHIFTER ENGLISH" 1:15

JOB 19332

4.12.2011

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Avatar

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CONTENT DEVELOPMENT PRODUCTION & POST INTERACTIVE MEDIA

Cooperation Development: U.S. – China Collaboration Platform and Tianjin Lishen Battery Joint-Stock CO., LTD.

- Mar, 2011** Dr. Ye Fan Wang Glavin visited Lishen CO. (Tianjin Binhai New District)
- April, 2011** Mr. David Flesher, Associate Provost for International Affairs of CWRU and representatives of CWRU visited Tianjin Lishen CO. (and Tianjin Science and Technology Commission)
- April, 2011** Dr. Xiao Gang (CNOOC) hosted collaboration discussion in Beijing
- May, 2011** Mr. Gao Junkui, VP of Tianjin Lishen CO. attended the EcoPartnership signing ceremony at the US State Department; visited CWRU
- June, 2011** Parties determine the initial focuses of cooperation programs
- July, 2011** The Platform and its potential partners (UL, Wellford, etc.) visit Tianjin Lishen Co to discuss cooperation projects)
- July, 2011** Mr. Chen Zhuobiao, VP of CNOOC-NEI met with Platform and Partners to provide support
- August, 2011** Mr. Qin Xincui, President of Lishen visits CWRU
- August, 2011** Mr. Qin and Mr. Flesher invited to U.S. Electric Vehicles and Battery Technology Seminar to speak on “EcoPartnerships: A model for U.S. – China Energy Collaboration”

Development: Proposed Cooperation Emphasis

June 2011



Long-term Collaboration Projects

- Develop next generation battery technology based on the results of the feasibility study and technology confirmation
- Technology (Feasibility Test) Strategies and Roadmap



Short-term Collaboration Projects

- High-capacity and High Security Lithium-ion Battery Technology Research
- Development of Low-cost Energy Storage Battery Technology



Safety and Quality Cooperation with other companies on lithium battery safety; integrate with existing CWRU battery and energy storage research and development



Education and Training



Support Lishen's **Strategic Expansion and Partnership Development** in the U.S.

U.S. – China Collaboration Platform

Lessons Learned and Take-aways (so far)

-  **Different Cultures/Different Histories**
-  **Build relationships – get to know each other**
-  **Partnership takes a long time and takes persistence**
-  **Important to have people who understand both sides**
-  **Understand the importance of government**
-  **Networks are hugely important**
-  **In the end – we all want the same thing – jobs, cleaner air, better performing technology, etc.**
-  **Cooperation is better than competing**
-  **“Sub national” partnership is where we will achieve results**
-  **Patience**
-  **Invitation is open to join us**



谢谢大家！
Thank you !

