Zhangjiakou Longchi Technology. Co., Ltd

Annual Production of 800 Million AH Energy
Storage Battery Manufacture

Innovation · Cooperation · Trust · Sharing

CONTENTS

01 Company Introduction

Company Profile

Established in Sept. 2017

Investment :3 billion RMB(450 million USD)

Industry Area :386K ㎡

Staff :500 workers

01

Company Address: Yudaishan Economic Development Zone Xiahuayuan District, Zhangjiakou Hebei Province

02

Focus on energy storage battery, and extends to large scale diversified application of energy storage and electronic devices.

03

Official Approval On Environmental Protection

张家口市行政审批局

张行审〔2018〕68号

张家口市行政审批局
关于张家口龙驰科技有限公司年产8亿安时动力（储能）锂电池生产线建设项目环境影响报告书的批复

张家口龙驰科技有限公司：

你公司所报《年产8亿安时动力（储能）锂电池生产线建设项目环境影响报告书》（报批版）已收悉。根据报告书结论意见，结合专家组评审意见及下花园区环保分局的审查意见，现批复如下：

一、张家口龙驰科技有限公司年产8亿安时动力（储能）锂电池生产线建设项目拟建于张家口市下花园区玉带山经济开发区。总占地面积580亩，总投资302459.72万元，其中环保投资800万元，占总投资的0.26%。主要建设内容：新建电芯生产车间、电池包生产及测试车间、研发中心、办公楼、动力站房、职工宿舍、食堂、污染治理设施及其他相关附属设施。该项目已于2017年8月在下花园区行政审批局备案（下行审建字[2017]65号）。

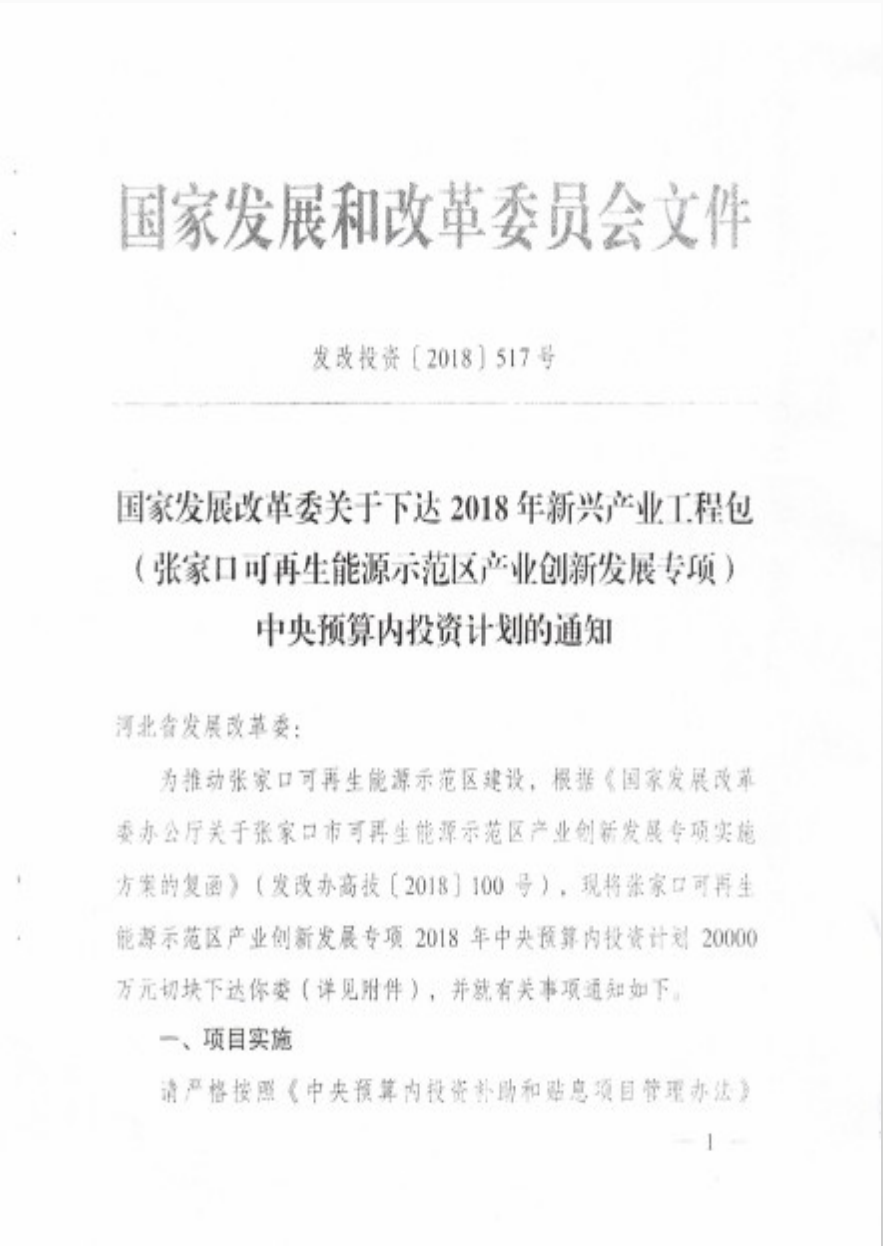
在全面落实环评报告书提出的各项环境保护措施，确保各类污染物达标排放的前提下，我局同意你公司按照环评报告书中所列建设项目的地点、性质、规模、拟采取的环境保护措施进行项目建设，报告书及批复可作为项目建设和环境管理的依据。

二、你公司在设计和建设中必须逐一落实环境影响报告书提出的各项环保措施，并保证各项环保工程与主体工程同时设计、同时施工、同时建成运行。尤其要做好以下工作：

（一）加强施工期环境管理

制定严格的规章制度，合理布置施工现场、安排施工时间。运输车辆采取限速、禁鸣等措施，同时严格落实环评报告中提出的其他各项噪声振动防治措施，确保施工期噪声满足《建筑施工场界环境噪声排放标准》(GB12523-2011)中的相应标准要求。制定扬尘治理专项方案，指定专人负责扬尘防治工作，严格落实建筑施工场地扬尘防治措施。做好施工场地内部及周边相关道路的硬化和抑尘工作，物料运输车辆和物料堆放场所须按要求加装抑尘设施，运输道路及施工现场定时洒水，在出入口明显位置设置扬尘防治公示牌。施工机械产生的废水经沉淀池沉淀处理后全部回用，不得外排。施工营地设置垃圾箱，生活垃圾由地方环卫部门定期清理。建筑垃圾按照相关规范要求妥善处置。

National Special Fund Support 5.75 Million USD



国家发展和改革委员会文件

发改投资〔2018〕517号

国家发展改革委关于下达2018年新兴产业工程包（张家口可再生能源示范区产业创新发展专项）中央预算内投资计划的通知

河北省发展改革委：

为推动张家口可再生能源示范区建设，根据《国家发展改革委办公厅关于张家口市可再生能源示范区产业创新发展专项实施方案的复函》（发改办高技〔2018〕100号），现将张家口可再生能源示范区产业创新发展专项2018年中央预算内投资计划20000万元切块下达你委（详见附件），并就有关事项通知如下。

一、项目实施

请严格按照《中央预算内投资补助和贴息项目管理办法》

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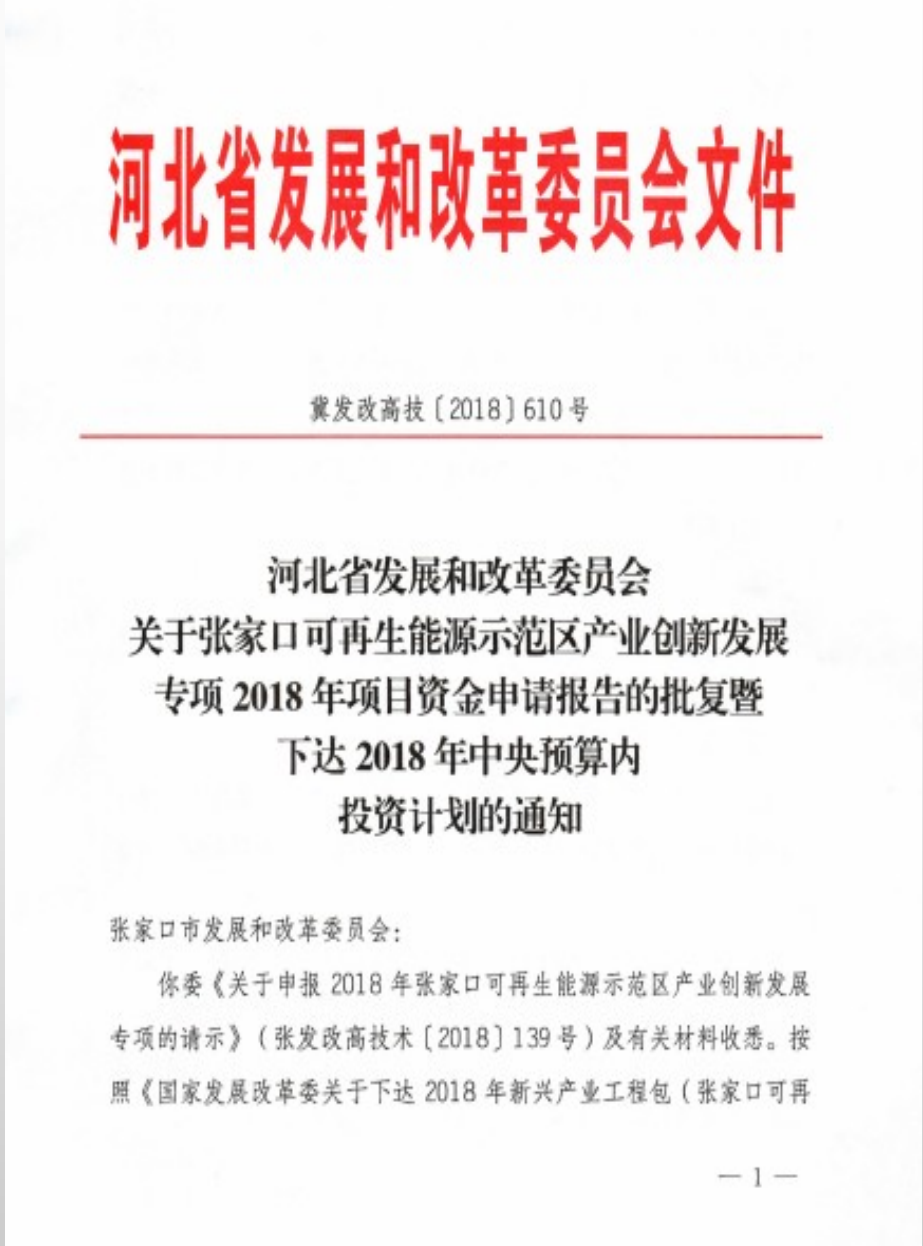


河北省发展和改革委员会文件

冀发改高技〔2018〕610号

河北省发展和改革委员会
关于张家口可再生能源示范区产业创新发展专项2018年项目资金申请报告的批复暨下达2018年中央预算内投资计划的通知

张家口市发展和改革委员会：

你委《关于申报2018年张家口可再生能源示范区产业创新发展专项的请示》（张发改高技术〔2018〕139号）及有关材料收悉。按照《国家发展改革委关于下达2018年新兴产业工程包（张家口可再

— 1 —

Policy Support

The 13th Five-Year-Plan for Renewable Energy Development

According to the “Administrative Measures on Investment Subsidies and Interests Discount in the Central Budget”, investment subsidies and interest subsidy funds are mainly used in the economic and social fields that the market cannot allocate the resources effectively and needs government support, including major scientific and technological development. The technology adopted in this project is the world‘s only vapour-deposited graphene lithium iron phosphate energy storage battery. The positive electrode uses water-soluble adhesive instead of the traditional PVDF/NMP adhesive, and the three wastes are zero, which solves the pollution problem of the battery industry for the first time. Due to the use of graphene composite fabrication technology, breakthrough is achieved in cycle life and cost, so that the cost problem in commercial energy storage power station is well solved. After the project is completed, it will contribute to the rapid development of China's new energy vehicles and energy storage industry, and realize the transformation and upgrading of the industry, **in line with the key support direction of the state industrial policies**

The project is in line with the state industrial policy and meets the development requirements of the “Development Plan for Renewable Energy Demonstration Zones in Zhangjiakou City, Hebei Province”; in line with “Forwarding Notice of Reply of National Development and Reform Commission Office on Implementation of Industrial Innovation and Development of Zhangjiakou Renewable Energy Demonstration Zone (HBDRC High Tech [2018] No. 207), issued by Hebei Development and Reform Commission (HBDRC).

Economic & Social impact

In the first year after the production reaching full capacity, the revenue is expected to reach 5.18 billion RMB(763M USD), net profit of 972 million RMB(143M USD) and the annual tax revenue of 260 million RMB(38M USD）.

80 targeted poverty alleviation households were signed. Currently more than 180 local labors are involved in construction。

More than 300 direct jobs are created in the first stage, and more than 550 jobs are expected to be created in three years.

Drive the development of local tourism and regional economy to increase the income of poor families and joint development of related industries.

02 Management Introduction

Core Management

Chairman

Chief scientist of energy storage power system

Director of Energy Storage Committee of China investment association

Famous as **"China's First Person in Energy Storage"**

Experienced in R&D of battery material technology& energy storage battery technology & new energy technology for many years.
Carried out the earliest independent R&D of power and energy storage lithium-ion battery water-soluble environmentally friendly battery production process, filling the gap in the world battery industry by achieving environmental protection from application to production process.

Dr. Zeng Chuisong

Core Management

CEO Of Longchi Technology

Mrs. Wu is former VP of a public company ,good at market development& risk management, proficient in team building and channel development.

Experienced in photovoltaic projects and has unique insights into the operation and development of the new energy industry. She has participated in the planning and promotion of application and has many domestic project experience & resources such as **Baotou Photovoltaic Frontrunner Base** (1GWh)& cooperation partners in new energy industry

Mrs. Wu Guifang

Core Management

CTO Of Longchi Technology

Graduated from School of **Peking University**, major of Chemistry and Molecular Engineering

Served as Manager of PULEAD Industry Co., Ltd.

Former Vice general manager of Hefei Guoxuan High-Tech Power Energy Co., Ltd.

Former Chairman, Hefei Guoxuan Battery Material Co., Ltd.

Leading talent in strategic emerging industries of Anhui Province
Awarded the first prize of Hefei Science and Technology Award
Special Support Award for Innovation and Entrepreneurship of Bengbu

Mr. Xu Xiaoming

Key Technical Expert

Chief Engineer

PhD in chemistry, Stanford University, USA
Introduced talent of National Thousand Youth Talent Programme of Organization Department of the CPC Central Committee
Director of the Engineering Institute, Hefei Guoxuan High-Tech Power Energy Co., Ltd.
Professor, doctoral supervisor of Huazhong University of Science and Technology
National Basic Research Programme of China (973 Programme)
Chief scientist of basic research on interface of high specific energy secondary lithium-sulfur battery

Dr. Xie Jia

Engineer

13 years of R&D on vehicle power battery
Granted 5 invention patents and 2 utility model patents
16 years of lithium battery research and industrialization engineering experience
Proficient in materials, processes and equipment, with rich experience in research and industrialization of lithium iron phosphate batteries and high-nickel ternary batteries.

Mr. Bai Ke

Key Technical Expert

The company's chief technical advisor, deputy director of the research department of Peking University, assistant to the dean of the School of Chemistry, doctoral tutor, and the person in charge of the key project of the National 863 Program Lithium Iron Phosphate

In 2012, he was selected as the "Young and Middle-Aged Leading Scientists, Engineers and Innovators"; in 2013, he was selected as "Ten Thousand Talent Programme"; in 2014, he was selected as "Hundred Talent Programme of Beijing"; in 2015, he was selected as distinguished talent of "Beijing Creation "at Capital Science and Technology Festival; in 2016, he was selected as the leading talent in science and technology innovation and technology entrepreneurship of Beijing.

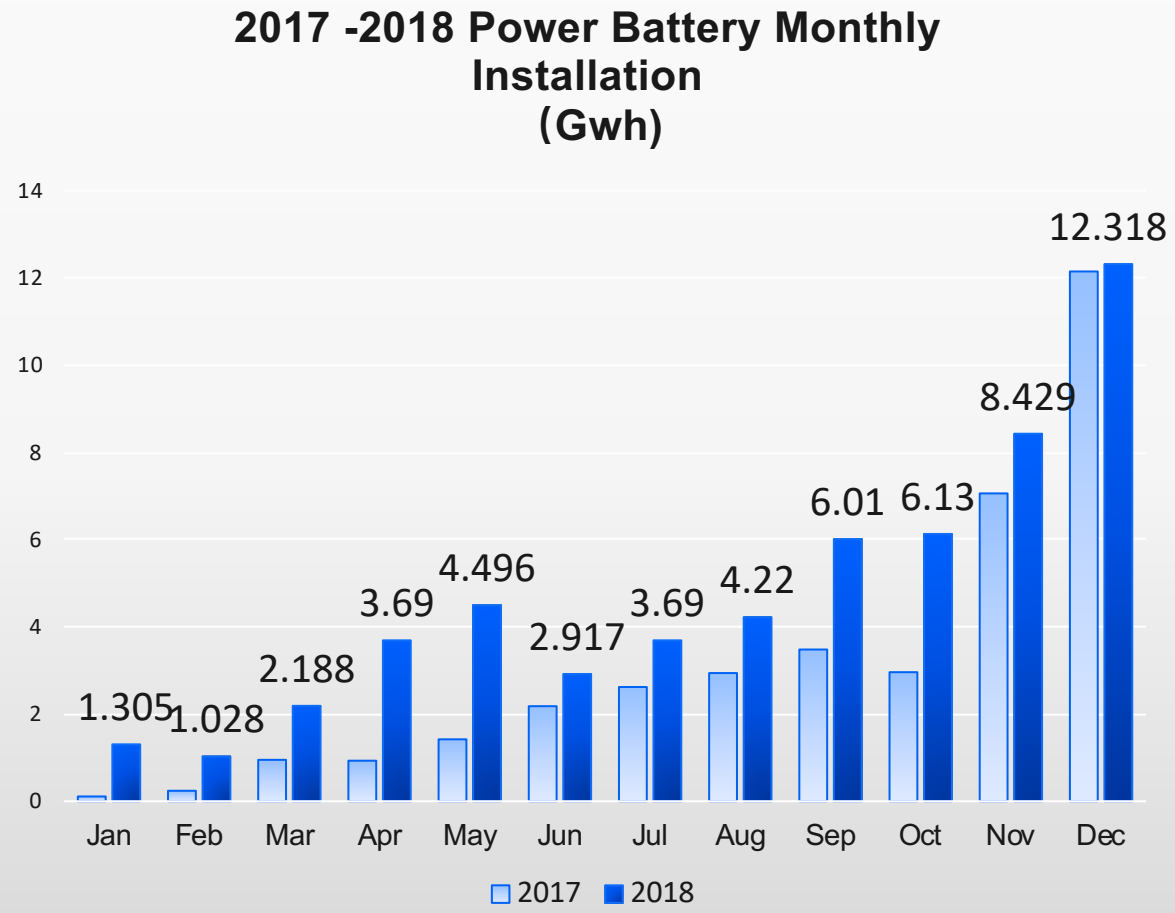
Since 1996, he has been involved in the research of lithium-ion batteries, new energy storage materials and energy storage devices. In recent years, more than 50 SCI papers have been published in internationally renowned magazines such as Advanced Materials and Nano Letters. SCI has been cited more than 1,000 times and 5 articles were selected as ESI high-cited paper. He has applied for 15 invention patents, of which 10 were granted.

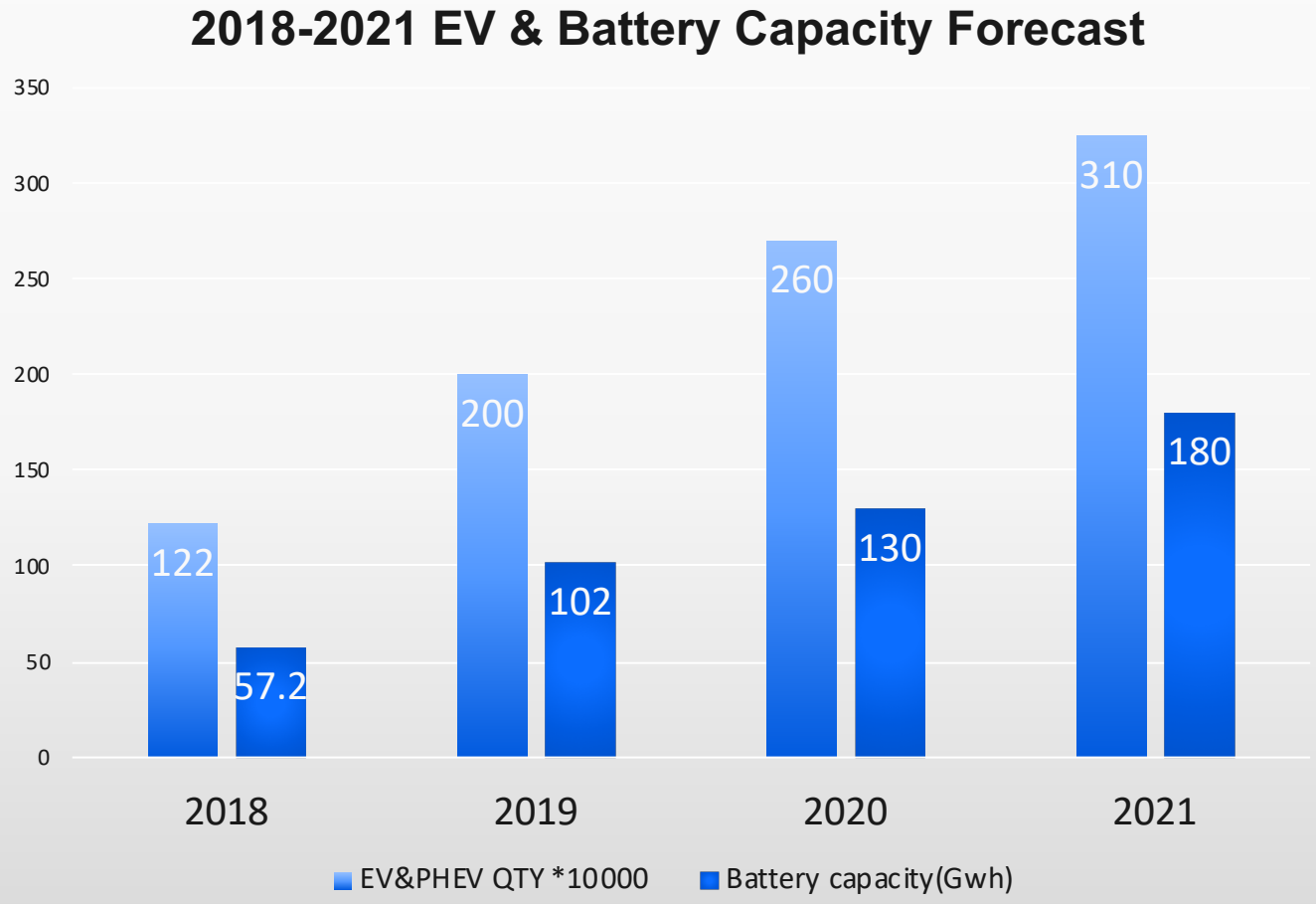
Over the years, he has undertaken and completed a number of national 863 program projects and provincial-level research projects, including a key project of 863 Program, made a number of breakthroughs on technical problems, many research results have been successfully industrialized. Independently designed and built large-scale production line of lithium iron phosphate cathode material featuring world advanced level was the first large-scale production and sales of lithium iron phosphate material in China

Mr. Chen Jitao

02 Industry Overview

Market Size

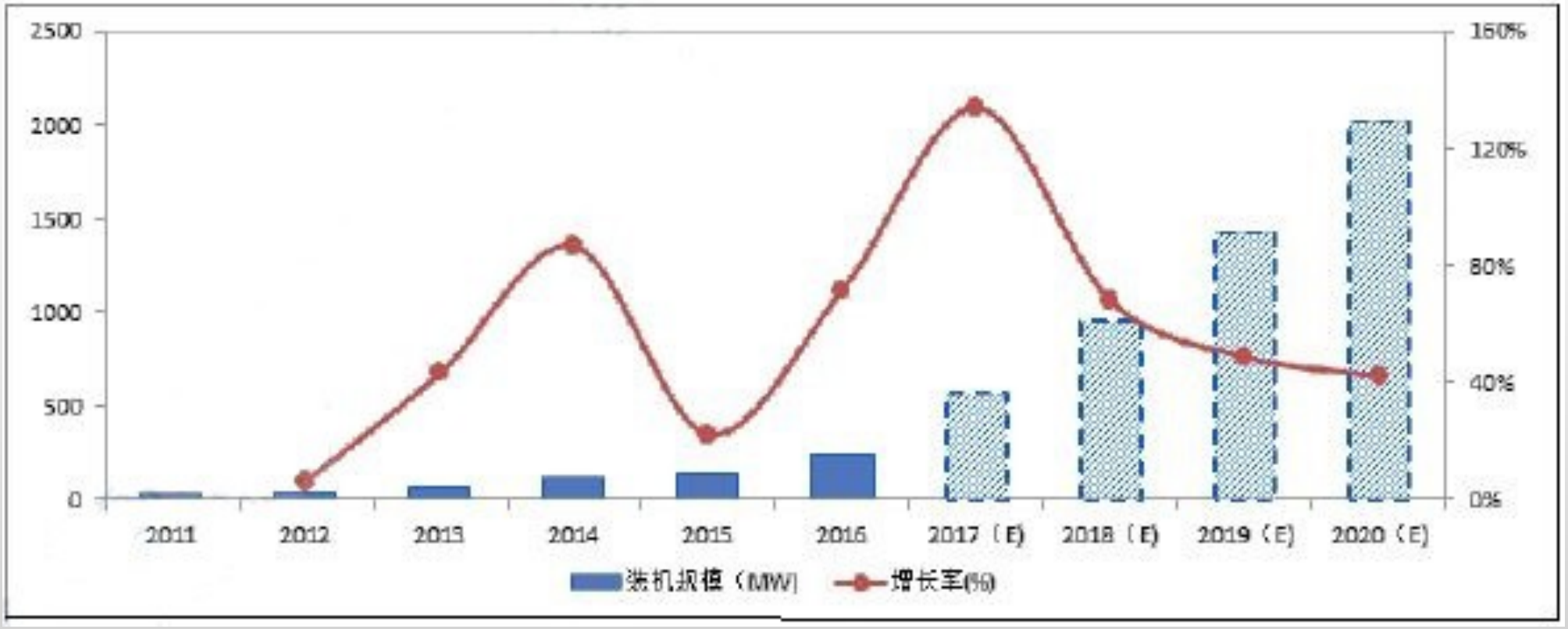




2018 Domestic new EV battery accumulatively installed 57.2Gwh Increased 57% than 2017 EV increased 65%
2018-2021, the battery installation market will keep growing , 2018-2021 CAGR will be around 33%

Energy storage market

October 2017, China officially issued Guidance on 'Promoting Energy Storage Technology and Industrial Development', and clearly stated that it will form an industrial scale through demonstration of energy storage application, and accelerate the breakthrough of bottlenecks such as the high cost of energy storage and environmental protection.



2017-2020 Forecast of Cumulative Installed Capacity of Electrochemical Energy Storage in China

Source: CNESA，2017,11

Energy storage battery pain points

Pollution

Waste residue, exhaust gas and waste

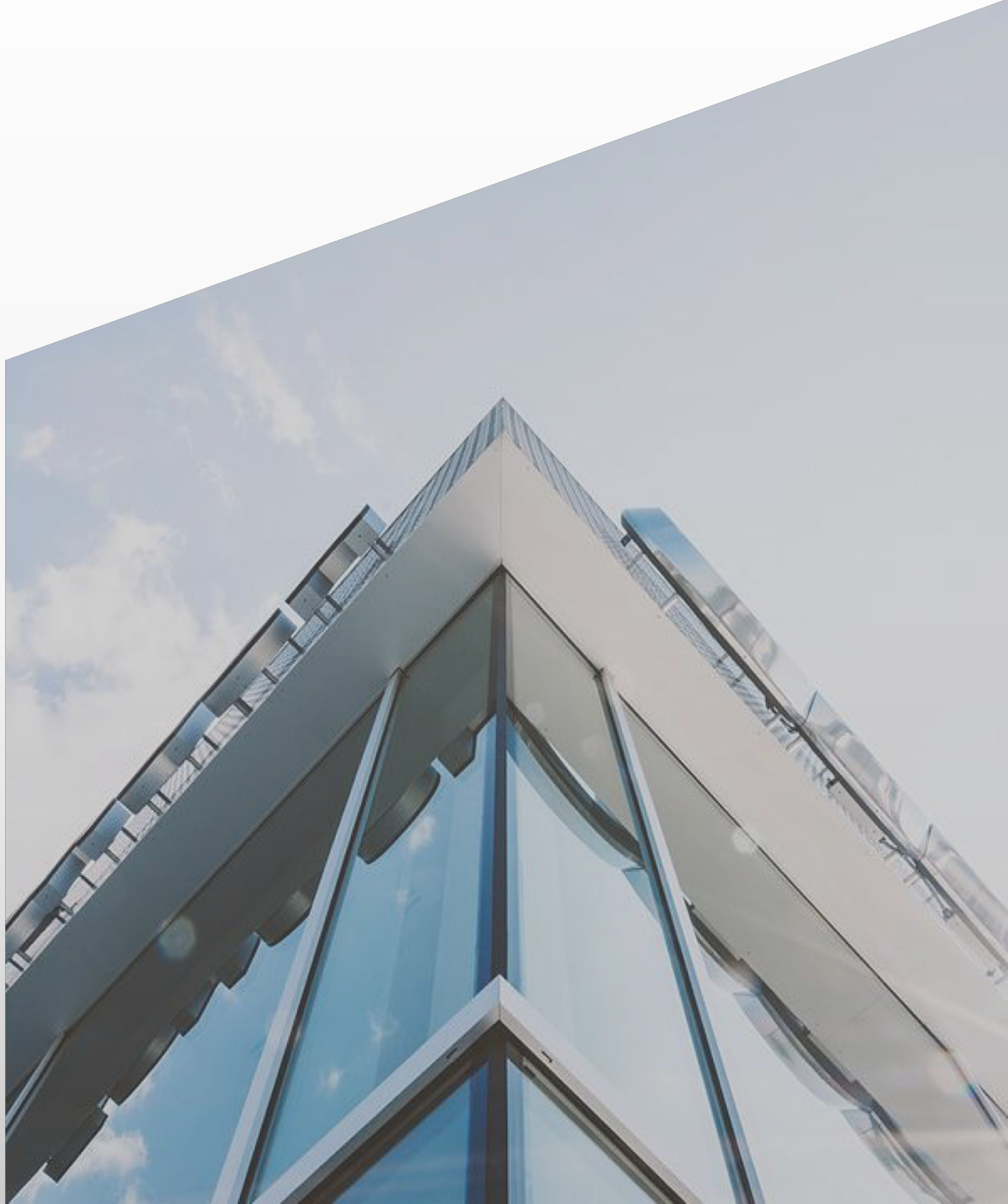
Short Battery Life

Cell surface moisture not properly controlled

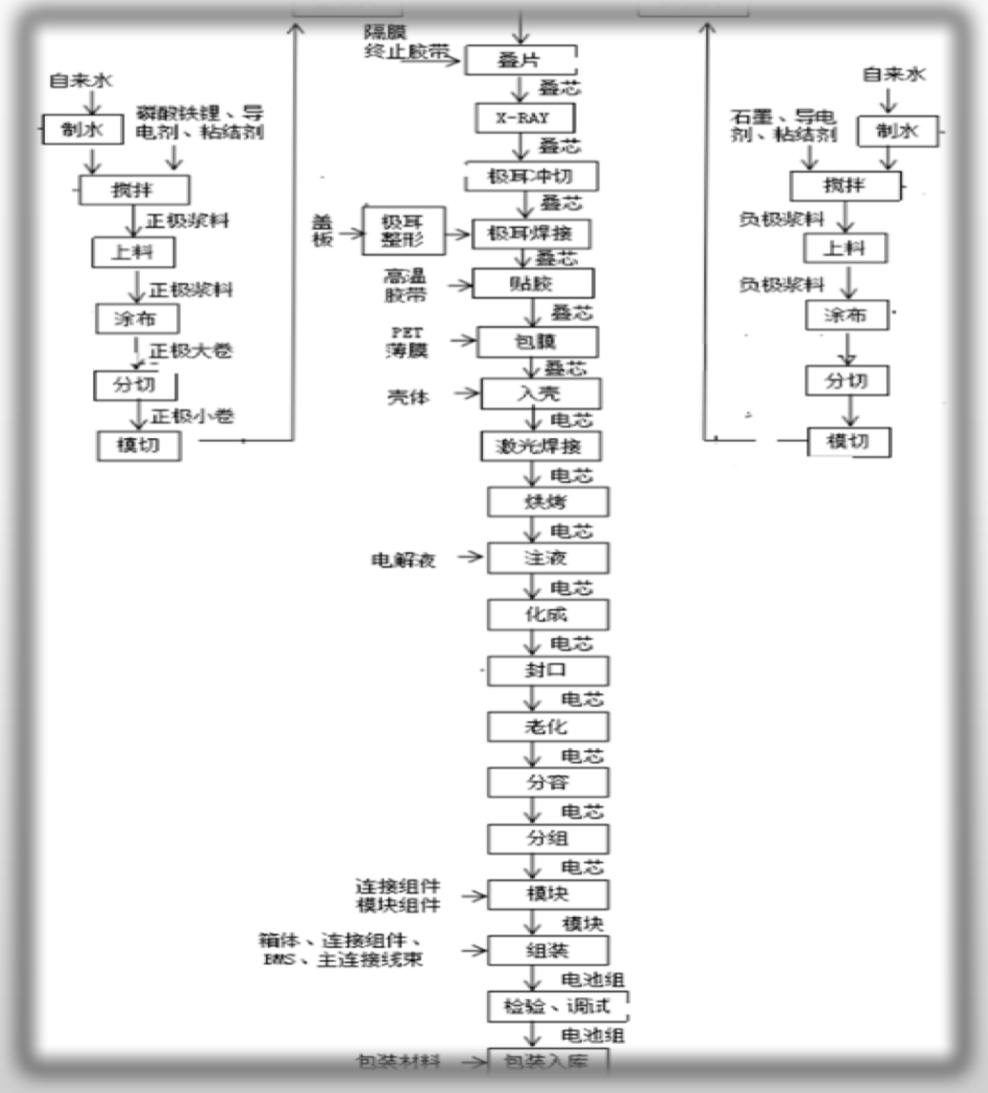
Time

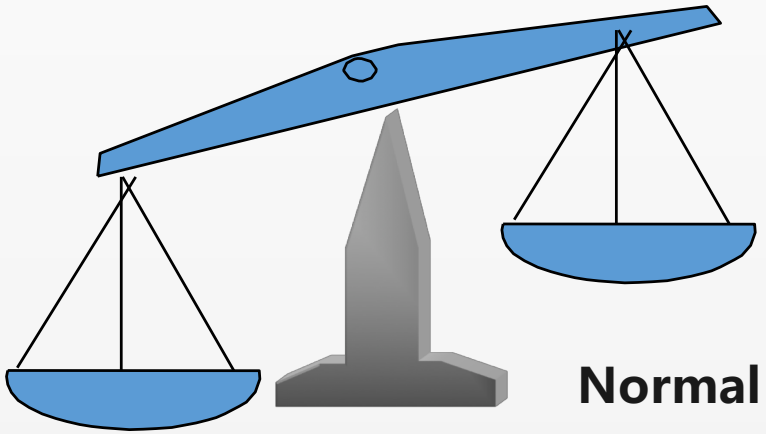
Preparation of electrode slurry takes long time

03 Longchi Product Introduction



Technological Process of the Longchi Project





Normal technological process

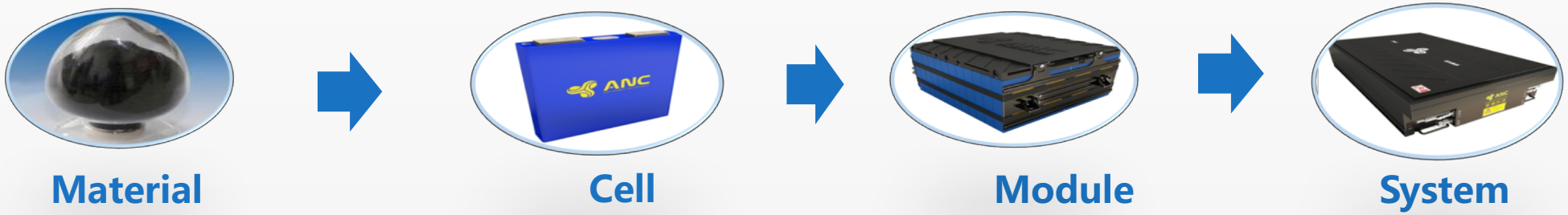
Technological Process of Longchi Project

The process adds 8 steps such as changing oil to water & moisture control process

Technological Innovation

Offer quality clean energy solutions

High specific energy | High power | High security | Low cost | Long battery life



Innovative process technology

1. Water-soluble + battery production process, the positive electrode uses water-soluble adhesive instead of traditional PVDF/NMP, achieveing battery clean production.

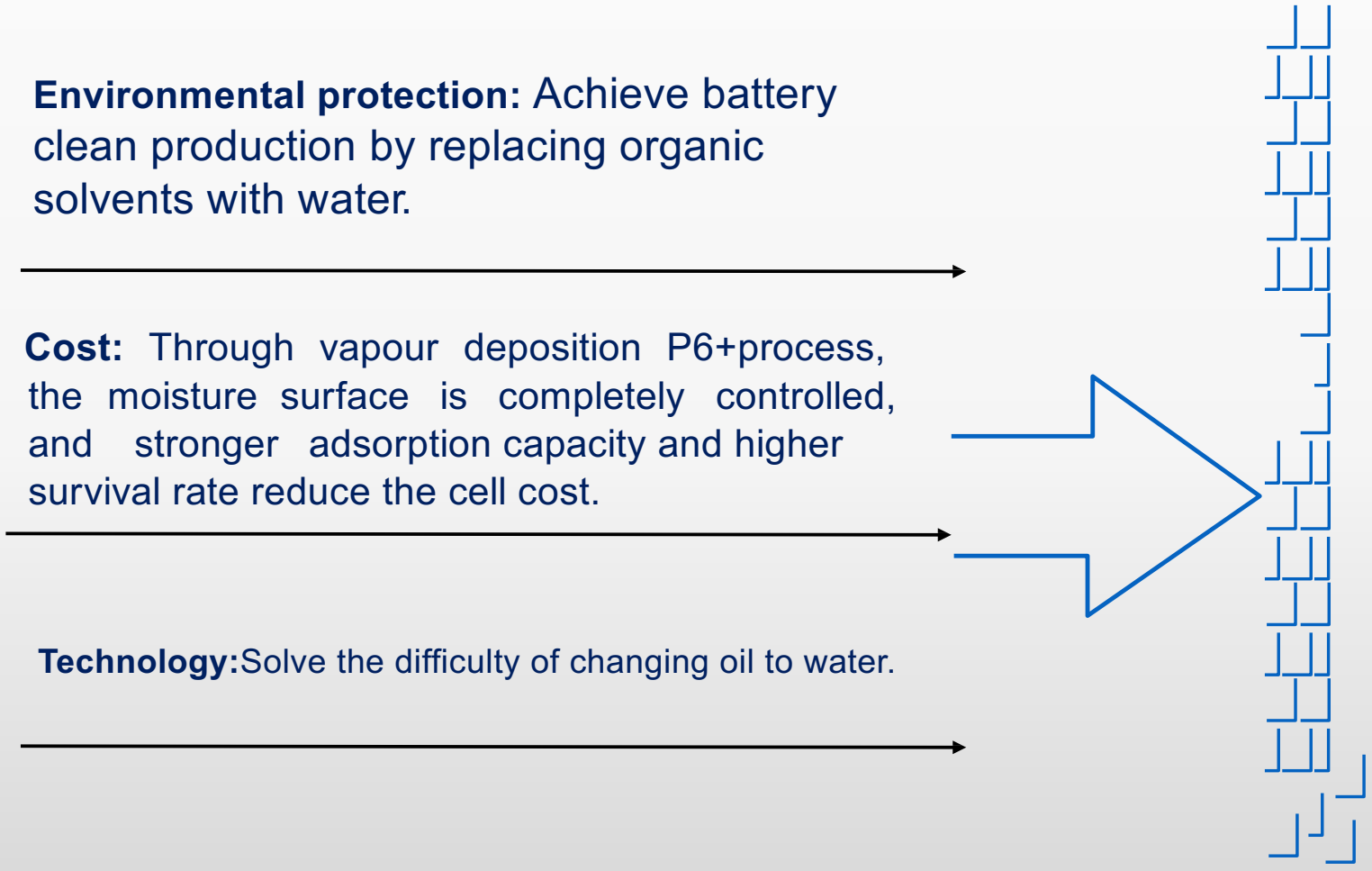
2. Graphene electrodes are deposited by means of vapour deposition P6+, which reasonably controls moisture and increases battery survival rate.

Technological Advantage

Environmental protection: Achieve battery clean production by replacing organic solvents with water.

Cost: Through vapour deposition P6+process, the moisture surface is completely controlled, and stronger adsorption capacity and higher survival rate reduce the cell cost.

Technology: Solve the difficulty of changing oil to water.



Improve low temperature performance

Improve multiplying power

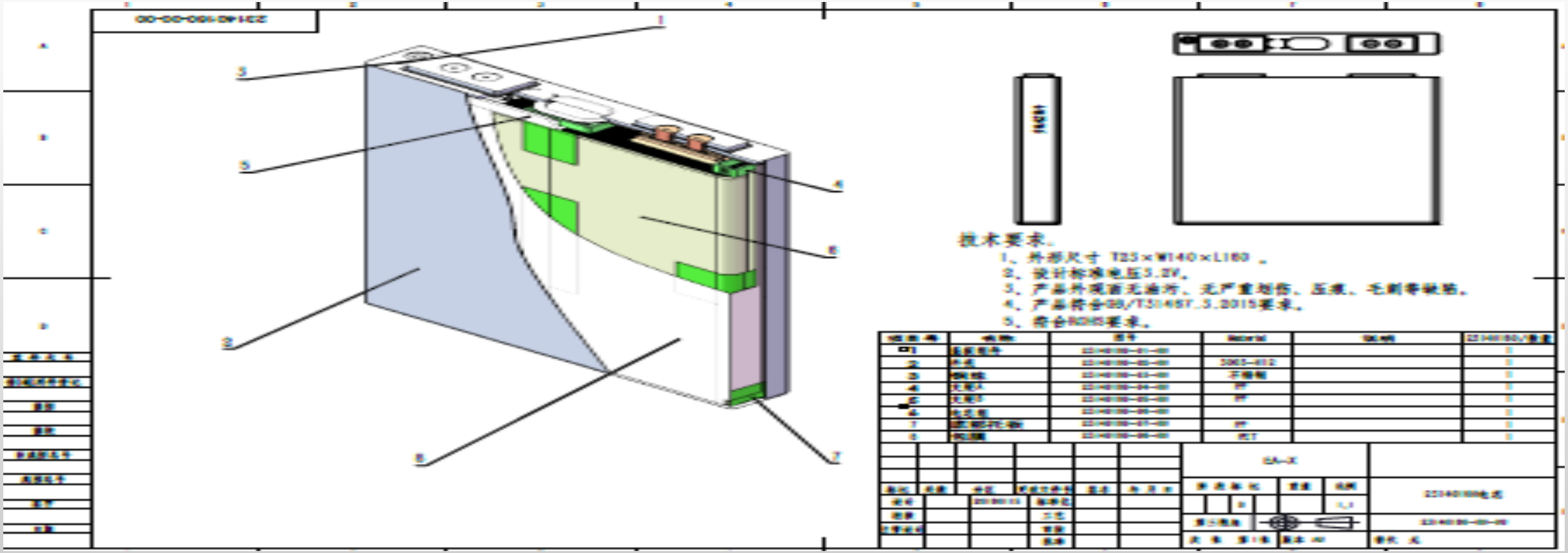
Battery life: 12000 times

Single density

Pack density

Product Solution

Product name	Product type	Battery shape	Product Qty (piece)	Factory capacity	Note
Lithium ion energy storage battery	Graphene lithium iron phosphate Energy storage battery	Square aluminum shell	12,307,692	800 million Ah	Storage battery



Comparison of technical Indicators

Comparison of product cycle life indicators

Company	Single cell cycle life （wh/kg）
CATL (LFP)	6000
BYD (LFP)	5500
EVE （LFP）	5000
GUOXUAN （LFP）	5000
NEVS (LFP)	4500
OptimumNano(LFP)	4000
Longchi	15000

Cycle life the Project's product battery life is **12000** time

Comparison of energy density indicators

Company	Single mass energy ddnsity (wh/kg)	PACK mass energy ddnsity (wh/kg)
CATL(LFP)	150	130
BYD(LFP)	150	125.6
EVE(LFP)	145	115
GUOXUAN(LFP)	150	115
NEVS(LFP)	150	125
OptimumNano(LFP)	145	115
Longchi	185	145

Energy density single energy density reaches **185wh/kg** ， system energy density reaches **145wh/kg**

Comparison of charging & discharging performance

Company	High & low temperature performance
CATL(LFP)	Charging discharging at -30℃ and +55℃ ，can discharge 90% at -30℃
BYD(LFP)	Charging discharging at -20℃ and +55℃ ，can discharge 80% at -20℃
GUOXUAN(LFP)	Charging discharging at -25℃ and +50℃ ，can discharge 80% at -25℃
WANXIANG(LFP)	Charging discharging at -20℃ and +40℃ ，can discharge 90% at -20℃
COSLIGHT(LFP)	Charging discharging at -30℃ and +50℃ ，can discharge 90% at -30℃
Longchi	**Charging discharging at -40℃ and +55℃ ，can discharge 75-80% at -40℃**

Source : according to other published product parameters 2017,11

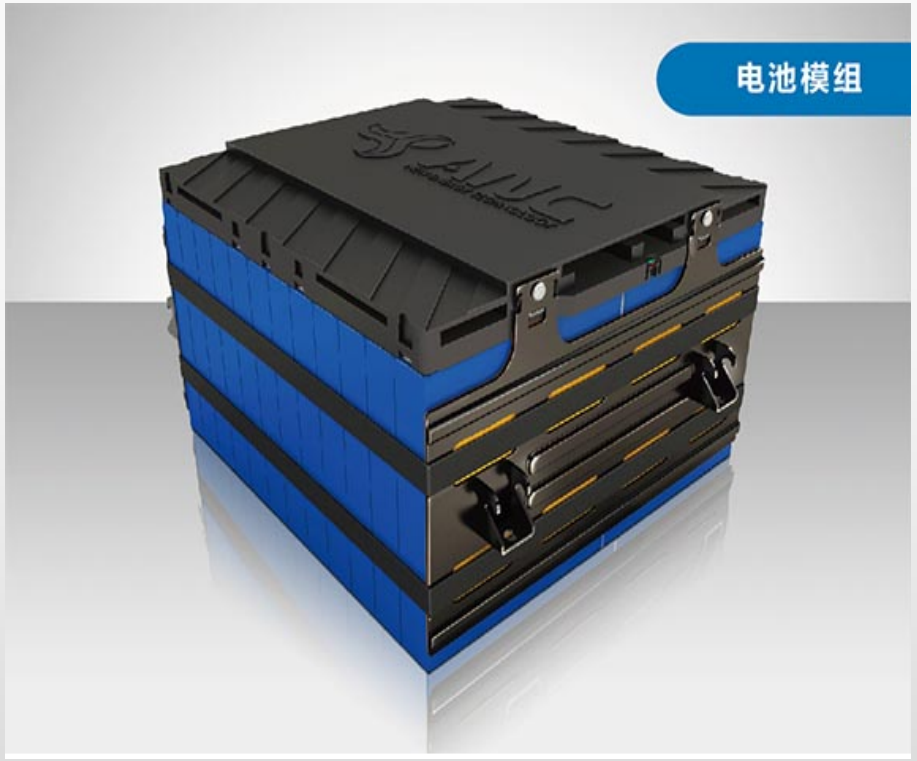
Product - Lithium iron phosphate battery

Battery

Model	EA01A
capacity	55Ah
Dimension	140mm*160mm*23mm
Height	160mm
Rated Voltage	3.2V
Operating voltage range	2.5V-3.65V
Operating temperature range (Discharge)	-20℃~60℃
Operating temperature range (Charge)	-5℃~60℃
Maximum charging rate (Duration)	1C
Maximum discharge rate (Duration)	2C
Energy density	160WH/KG
weight	1.1KG
Cycle life	≥8000 times

Product –Battery Module

Battery module



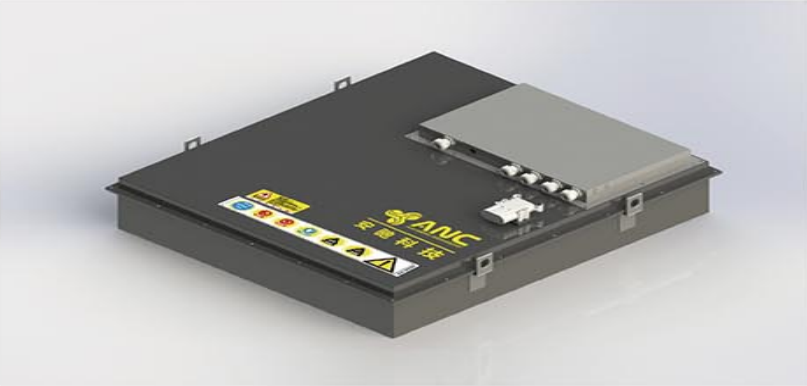
Module Model	123AH /246AH/184.5AH/369AH
Module electric power consumption	4.7KWH
Maximum charging rate (Duration)	1C
Maximum discharge rate (Duration)	2C
Module Model	**1P6S**
Module voltage	19.2v
Module electric power consumption	1.1KWH
Module electric capacity	61.5AH
Maximum charging rate (Duration)	1C
Maximum discharge rate (Duration)	2C
Module Model	**2P8S**
Module voltage	25.6.v
Module electric power consumption	3.15KWH
Module electric capacity	123AH

Product –Battery System

Battery system

Model	Battery system A	Battery system B	Battery system C	Battery system D
Power consumption	25.3KWh	16.9KWh	38.0KWh	23.6KWh
Size	1065mm*630mm*240mm	760*630*230mm	1065mm*920mm*240mm	975mm*645mm*215mm
IP Rating	IP67	IP67	IP67	IP67
Operating temperature range (Discharging)	-20℃~60℃	-20℃~60℃	-20℃~60℃	-20℃~60℃
Operating temperature rage (Charging)	-5℃~60℃	-5℃~60℃	-5℃~60℃	-5℃~60℃
Maximum discharge rate	2C	2C	2C	2C
Maximum charge rate	1C	1C	1C	1C
Energy density	123WH/KG	120WH/KG	125WH/KG	140WH/KG
Fast charging	1C（30&~80%SOC）	1C (30%~80%SOC)	1C （30%~80%SOC）	1C （30%~80%SOC）
Communication interface	CAN	CAN	CAN	CAN

Product –Battery Pack



Model	Pack -1	Pack -2	Pack -3
Power consumption	73.6V 32.4kwh	25.6V 4.2kwh	48V 21kwh
Size	1100mm*980mm*260mm	508mm*190mm*505mm	700mm*470mm*455mm
IP Rating	IP67	IP65	IP65
Operating temperature range (Discharging)	-20℃~55℃	-20℃~55℃	-20℃~55℃
Operating temperature rage (Charging)	0℃~55℃	0℃~55℃	0℃~55℃
Maximum discharge rate	0.75C	1C	0.75C
Maximum charge rate	0.5C	0.75C	0.5C
Fast charging	0.4C（30%~80%SOC）	1C（30%~80%SOC）	0.4C（30%~80%SOC）
Communication interface	CAN	CAN	CAN

Multi battery power distribution solutions

55Ah power distribution （8M EV)

Battery cell capacity			55Ah			
Solution	System voltage	Arrangement	Container Allocating	Power consumption	Cell Qty	Module Qty
1	614.4V	3P/192S	4A/ (1A+2C)	101.4KWh	576	24
2	499.2V	4P/156S	2B+2C	109.8KWh	624	26
3	518.4V	4P/162S	3A+1C	114KWh	648	27

多元化产品配电方案

55Ah power distribution（10M EV)

Battery cell capacity			55Ah			
Solution	System voltage	Arrangement	Container Allocating	Power consumption	Cell Qty	Module Qty
1	499.2V	6P/156S	5A1C/2A3C	164.7KWh	936	39
2	512V	6P/160S	6A1B	169KWh	960	40
3	537.6V	6P/168S	7A	177.4KWh	1008	42

Product applications & Solutions

EV

Car type	BEV
Battery cell type	Lithium iron phosphate LiFePO4 Or Ternary lithium Li(NiCoMn)O2
LiFePO4	> 115wh/kg
Li(NiCoMn)O2	> 120wh/kg

Car type	HEV
Battery cell type	LiFePO4 or Li(NiCoMn)O2
LiFePO4	> 115wh/kg
Li(NiCoMn)O2	> 120wh/kg
Battery power consumption	18KWh

Product applications & Solutions

EV BUS

Car type		8.5M/10.5M			
Cell type		Lithium iron phosphate LiFePO4			
Capacity density		≥122wh/kg			
Rating power		101.4KWh/164.7KWh			
Rating voltage		614.4V/499.2V			
Voltage range		480V~700.8V/390V~569.4V			
25℃ Charging capacity (SOC > 40%)		25℃ Discharging capacity (SOC > 40%)		-15℃ Discharging capacity (SOC > 40%)	
Max	1C (30%≤SOC≤70%& 20℃≤temp≤40℃)	Max	2C	Max	0.5C
Battery SOC operating range		10%~100%			
Operating status homogeneity		< 10%			

Energy storage application

Power grid energy storage

Solution Flexible allocation of energy supply, improve the utilization rate of existing transmission and distribution network, delay the investment of distributed power supply access for transmission and distribution equipment, and improve the flexibility and reliability of power supply by micro grid power support.

Advantage： Quickly respond to frequency modulation and voltage regulation instructions；
Charging and discharging switching time is within 50ms;
System modular design, easy to install, debug, maintenance and system expansion;
Unique online battery equalization technology and control strategy;
Independently developed battery monitoring and system monitoring software which can run automatically
Self-switching of grid on-off network.
Smart battery management system, remote monitoring and data download by the Interne.

Products are widely applied to various occasions of energy storage, such as grid energy storage, load frequency control, load adjusting, and independent/distributed generation (dg) in power network, data center, communication base station, UPS, home storage, railway/subway, mobile storage, etc., product type micro/small energy storage equipment, standard machine cabinet energy storage equipment, container type energy storage equipment, large and super large integrated energy storage equipment 。

储存应用

Energy storage & generation station

Solution ：Smooth power output, reduce the off-limit probability of power fluctuation and the unit loading capacity
Reduce predicted power output errors

Advantage ： Reduce waste light, waste wind, improve eficiency
Reduce the instantaneous power rate of change, reduce the impact of the grid
Tracking schedule to improve network connection controllability
Improve the forecast accuracy of generation, more stable
Independently developed battery monitoring and system monitoring software which can run automatically

Products are widely applied to various occasions of energy storage, such as grid energy storage, load frequency control, load adjusting, and independent/distributed generation (dg) in power network, data center, communication base station, UPS, home storage, railway/subway, mobile storage, etc., product type micro/small energy storage equipment, standard machine cabinet energy storage equipment, container type energy storage equipment, large and super large integrated energy storage equipment.

储存应用

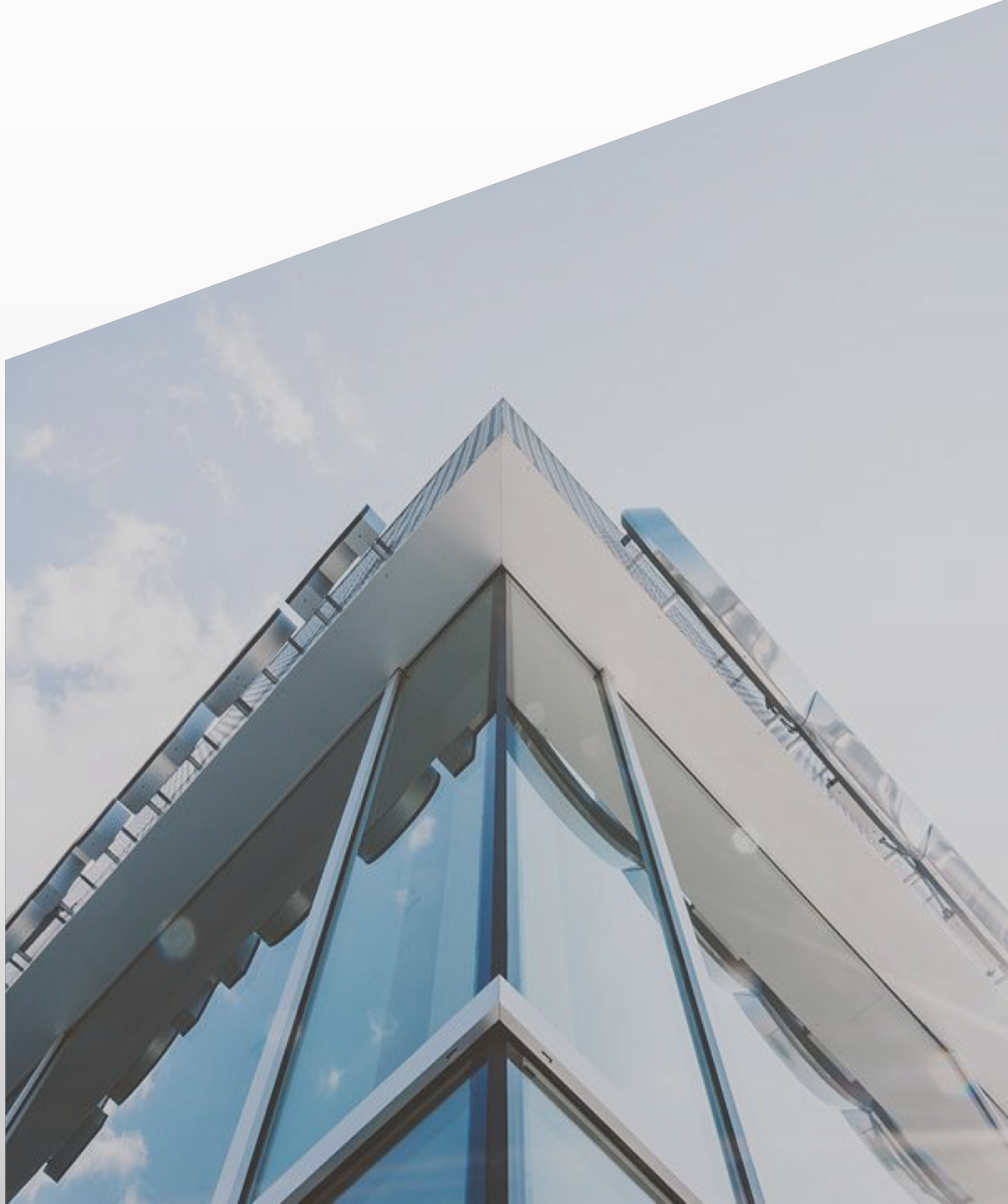
Family energy storage UPS (Uninterruptible Power Supply)

Solution: Smart charge and discharge management module
Supporting the grid AC and solar photovoltaic (PV) DC input charge
Family backup power supply
For important industrial equipment, network services, road lighting etc. to provide uninterrupted power supply

Advantage ： High efficiency, high reliability, high intelligence, long standby time
Intelligent automatic switch, achieve unattended
Humanized alarm function, perfect online protection
Wi-fi communication, wireless control, Indoor LCD wireless controller remote operation by phone and PC

Products are widely applied to various occasions of energy storage, such as grid energy storage, load frequency control, load adjusting, and independent/distributed generation (dg) in power network, data center, communication base station, UPS, home storage, railway/subway, mobile storage, etc., product type micro/small energy storage equipment, standard machine cabinet energy storage equipment, container type energy storage equipment, large and super large integrated energy storage equipment.

04 Patents & Awards



Patents

证书号第2614328号

发明专利证书

发明名称：一种氧化铝包覆锂离子电池正极材料的制备方法

发明人：蒋吉平

专利号：ZL 2015 1 0309653.3

专利申请日：2015年06月05日

专利权人：蒋吉平

授权公告日：2017年09月08日

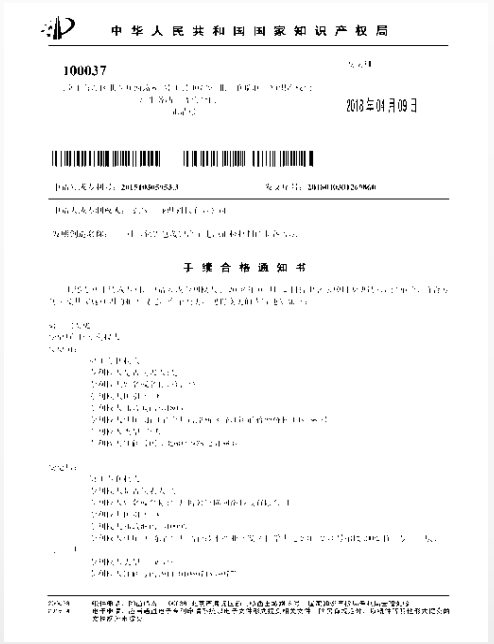
本发明经过本局依照中华人民共和国专利法进行审查，决定授予专利权，颁发本证书并在专利登记簿上予以登记。专利权自授权公告之日起生效。

本专利的专利权期限为二十年，自申请日起算。专利权人应当依照专利法及其实施细则规定缴纳年费。本专利的年费应当在每年06月05日前缴纳。未按照规定缴纳年费的，专利权自应当缴纳年费期满之日起终止。

专利证书记载专利权登记时的法律状况。专利权的转移、质押、无效、终止、恢复和专利权人的姓名或名称、国籍、地址变更等事项记载在专利登记簿上。

局长
申长雨

第1页(共1页)



中华人民共和国国家知识产权局

100037

2018年04月09日

手续合格通知书

证书号第2809935号

发明专利证书

发明名称：一种锂电池用石墨烯-二硫化钼复合导电浆料及制备方法

发明人：陈庆;陈兵;王恒建;曾军堂

专利号：ZL 2016 1 0909639.0

专利申请日：2016年10月19日

专利权人：成都新柯力化工科技有限公司

授权公告日：2018年02月09日

本发明经过本局依照中华人民共和国专利法进行审查，决定授予专利权，颁发本证书并在专利登记簿上予以登记。专利权自授权公告之日起生效。

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局长
申长雨

2018年02月09日

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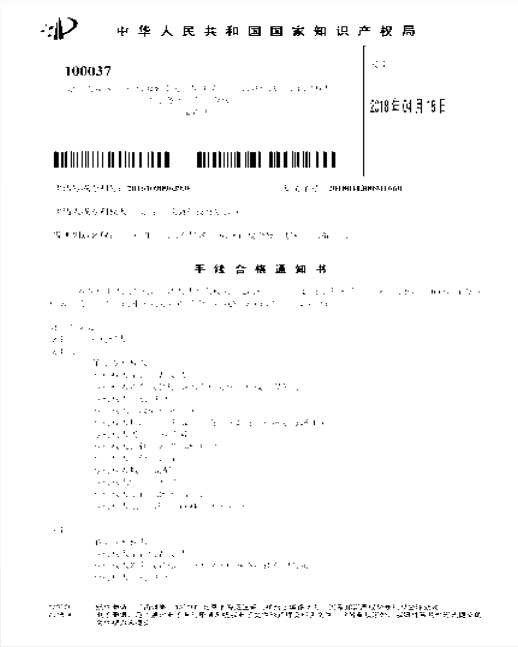

中华人民共和国国家知识产权局

100037

2018年04月16日

手续合格通知书

证书号第1737417号

发明专利证书

发明名称：一种锂离子电池纳米LiMPO4正极材料的制备方法

发明人：陈继涛;苏凯;刘锋

专利号：ZL 2013 1 0022787.7

专利申请日：2013年01月22日

专利权人：北京大学

授权公告日：2015年07月29日

本发明经过本局依照中华人民共和国专利法进行审查，决定授予专利权，颁发本证书并在专利登记簿上予以登记。专利权自授权公告之日起生效。

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局长
申长雨

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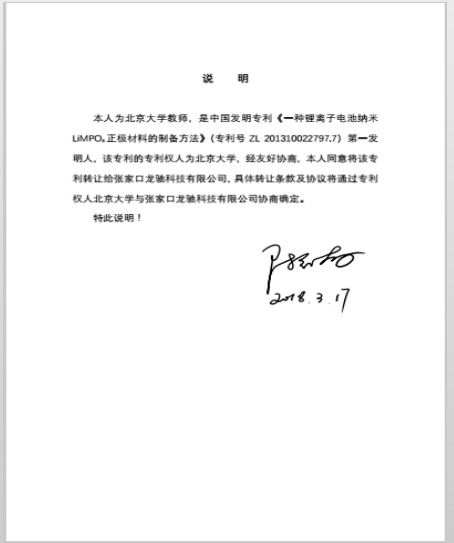

说　明

本人为北京大学教师，是中国发明专利《一种锂离子电池纳米LiMPO4正极材料的制备方法》(专利号 ZL 201310022797.7)第一发明人，该专利的专利权人为北京大学，经友好协商，本人同意将该专利转让给张家口龙驰科技有限公司，具体转让条款及协议将通过专利权人北京大学与张家口龙驰科技有限公司协商确定。

特此说明！

2018.3.17

Awards

Zhangjiakou Longchi Technology Co., Ltd. represented Xiahuayuan District to participate in “China Wings” Venture Innovation Competition in July 2018 with “Annual Production of 800 Million AH (Storage Energy) Lithium Battery Production Line Development Project”, and won the second prize in Innovation Group in the Final of Zhangjiakou region.

In October, the project represented Hebei province to participate in national final and was awarded “Innovative Wing Star Award” in the innovation group. Yudaishan Economic Development Zone won “Distinguished Entrepreneurship Service Agency”.

In the meantime, the project of annual production of 800 million AH (storage energy) lithium battery production line development has been listed in national major construction project bank.

Make people a better life

Thanks

Innovation · Cooperation · Trust · Sharing