新一代液流电池储能技术及产业化

Researches and Industrialization of New-Generation Flow Battery Energy Storage Technologies

成果简介：

团队面向国家战略重大需求，解决了液流电池产业化过程中存在的关键科学与技术问题，突破了新一代高功率密度全钒液流电池、用户侧锌基液流电池关键材料、核心部件电堆及系统集成等关键核心技术。近五年，实施了包括国内最大10MW/40MWh全钒液流电池储能系统在内的近20项商业化示范项目。承建了全球最大200MW/800MWh液流电池储能调峰电站，目前已完成一期(100MW/400MWh)主体工程建设。申请国内外发明专利200余项，形成液流电池关键材料、核心部件和系统等完善的知识产权保护体系。牵头制定了包括首项液流电池国际标准在内的19项标准，引领全球液流电池技术发展，获得了同行高度认可，产生了显著的经济、社会效益，有力推动了液流电池产业化进程。

Introduction:

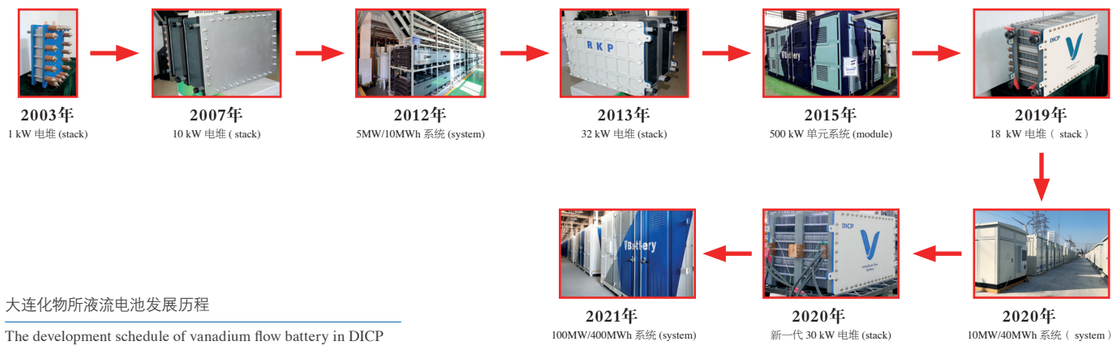
Large scale energy storage devices are essential for wide application of renewable energies and further achieving carbon neutrality. To meet the great strategy demands for large scale energy storage, the team figured out the critical challenges in the industrialization of flow battery energy storage technologies, and broke through the key technologies including advanced materials, core components of cell stack and system integration for new-generation vanadium flow battery technologies with high power density and zinc-based flow batteries for utilization application by close collaboration with industry. Over the past five years, the team has implemented for nearly 20 demonstration projects including the largest National 10 MW/40 MWh vanadium flow battery system. The project team is constructing the world's largest 200 MW/800 MWh vanadium flow battery system, of which the first phase construction of 100 MW/400 MWh has finished. In the last five years, the team has filled more than 200 patents and the completely independent intellectual property rights for advanced materials for flow batteries, key components and systems have been formed. The team has lead the development on the international and national standards, of which 19 standards have been implemented. The team effectively promoted the commercialization of flow batteries and has achieved significant economic and social benefits.

储能系统集装箱

Containers for energy storage system

屋顶 PCS 系统放置现场

PCS system in housetop



大连化物所液流电池发展历程

The development schedule of vanadium flow battery in DICP

推荐单位 / Recommended Unit

中国科学院大连化学物理研究所
Dalian Institute of Chemical Physics, Chinese Academy of Sciences

完成单位 / Accomplished Unit

中国科学院大连化学物理研究所
Dalian Institute of Chemical Physics, Chinese Academy of Sciences

合作单位 / The Main Cooperation Units

大连融科储能技术发展有限公司
Dalian Rongke Power Co., Ltd.
大连融科储能装备有限公司
Dalian Rongke Power Integration Co., Ltd.
华秦储能技术有限公司
Huaqin Energy Storage Technology Co., Ltd.
陕西华银科技股份有限公司
Shaanxi Huayin Technology Co., Ltd.
金尚新能源科技股份有限公司
Baodi Goldsun Co., Ltd.
以化（上海）投资有限公司
ICL Investment Co., Ltd. (Shanghai)

膜材料批量化生产中试平台

The produce-line of membranes

示范项目现场电解液储罐

Electrolyte tanks for the demonstration project

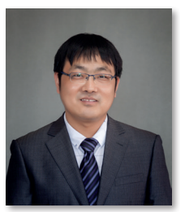
社会效益和经济效益：

团队基于液流电池相关研究成果与多家企业开展“产、学、研”合作、建立联合研发平台，推进技术成果转化应用。近5年在国内外先后实施了液流电池储能系统近20项商业化示范项目，合同总额超过30亿元，新增销售额7.1亿元。建成全球最大100MW级液流电池储能调峰电站，完成投资超过10亿元。实现了液流电池在发电侧、输配电侧及用户侧储能领域的广泛应用，带动了储能产业上下游的发展，形成了良好的储能集群效应，促进了我国储能行业的技术进步、区域创新和新能源产业发展，为我国能源结构调整、实现“碳达峰、碳中和”目标提供了重要技术支撑。

Social and Economic Benefits:

Based on the close collaboration between institute and industry, the team has implemented for nearly 20 commercial demonstration projects in the last five years, which created a total amount of the contract for more than 3 billion RMB, together with an upturn in the sales of 7.1 hundred million RMB. The team finished the construction of the world's largest 100 MW level flow battery system with more than 1 billion RMB of investment. Their achievements effectively accelerated the widespread applications of flow battery technologies in different fields including electricity generation, transmission and distribution and user side, which promoted the commercialization and industrialization of flow batteries, and further development of energy storage industry, with the formation of favorable effect on mainchain of energy storage. These progresses have made significant contribution to the technical development in flow battery. These progresses also provide critical technological support for accelerating the application of large-scale energy storage in power peak-shaving and grid connection of renewable energies, promoting energy revolution, adjusting energy structure, and achieving the target of carbon peak and carbon neutrality.

团队成员 / Team Members:



李先锋
Li Xianfeng

中国科学院大连化学物理研究所
主要贡献：团队负责人，发明核心关键技术，组织技术开发与产业化。

Dalian Institute of Chemical Physics, Chinese Academy of Sciences
Main contributions: Team leader, inventing the key technologies, leading the R&D and industrialization of the technologies.

张华民
Zhang Huamin

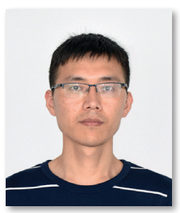
中国科学院大连化学物理研究所
主要贡献：学术与技术指导。

Dalian Institute of Chemical Physics, Chinese Academy of Sciences
Main contributions: Academic and technical guidance.

刘宗浩
Liu Zonghao

大连融科储能技术发展有限公司
主要贡献：系统集成与应用示范。

Dalian Rongke Power Co., Ltd.
Main contributions: System integration and demonstration of vanadium flow battery technology.



刘　涛
Liu Tao

中国科学院大连化学物理研究所
主要贡献：双极板材料制备及批量化生产。

Dalian Institute of Chemical Physics, Chinese Academy of Sciences
Main contributions: Fabrication and mass production of bipolar plate.

王晓丽
Wang Xiaoli

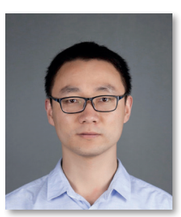
大连融科储能技术发展有限公司
主要贡献：全钒液流电池技术产业化推广。

Dalian Rongke Power Co., Ltd.
Main contributions: Industrialization promotion of vanadium flow battery technology.

郑　琼
Zheng Qiong

中国科学院大连化学物理研究所
主要贡献：电池结构设计及标准制定。

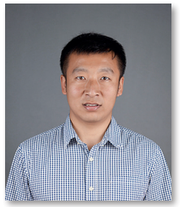
Dalian Institute of Chemical Physics, Chinese Academy of Sciences
Main contributions: Battery structure design and standard establishment.



袁治章
Yuan Zhizhang

中国科学院大连化学物理研究所
主要贡献：锌基液流电池技术开发。

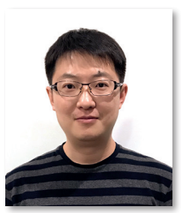
Dalian Institute of Chemical Physics, Chinese Academy of Sciences
Main contributions: Development of zinc-based flow battery technologies.



史丁秦
Shi Dingqin

中国科学院大连化学物理研究所
主要贡献：膜材料规模放大工艺。

Dalian Institute of Chemical Physics, Chinese Academy of Sciences
Main contributions: Upscaling of membranes.



邢　枫
Xing Feng

中国科学院大连化学物理研究所
主要贡献：电池结构设计及集成。

Dalian Institute of Chemical Physics, Chinese Academy of Sciences
Main contributions: Battery structure design and integration.

段寅琦
Duan Yinqi

中国科学院大连化学物理研究所
主要贡献：膜材料批量化生产。

Dalian Institute of Chemical Physics, Chinese Academy of Sciences
Main contributions: Manufacturing of membrane materials.