



德国 推动充电站建设的启示

Promote the construction of charging stations of enlightenment in Germany

充电基础设施建设一直是制约中国电动汽车市场化的瓶颈，尽管政府高度重视充电设施的建设，但不少业内人士对其今后的盈利模式仍心存疑虑。此前，中德统一充电标准，让人们开始关注德国电动汽车的发展。德国作为世界汽车强国，除了传统汽车的发展，德国在新兴电动汽车领域也走在前列。得益于购车免税政策和充电基础设施的普及，目前德国纯电动汽车的销量较高。德国充电基础设施建设的经验，有启示和示范作用，值得借鉴和学习。

充电站覆盖率高助推市场发展

德国电动车市场发展迅速，充电站覆盖率高是一个重要原因。近年来，德国充电站增长迅速，2013年已经达到4454座。北莱茵-威斯特法伦州、巴登-符腾堡州、黑森州以及巴伐利亚州是德国公共充电站数量最多的四个州。这些州充电站数量增多有如下三方面原因：

其一、政府扶持。政府导向是产业发展的风向标。上述四州都属于德国政府重点扶持的电动化模范州。2009~2011年，德国政府拨款5亿欧元扶持包括修建充电站、电池科技研发在内的城市清洁能源项目。

其二、汽车产业集聚。巴登-符腾堡州和巴伐利亚州均拥有一流整车厂(戴姆勒、奥迪和宝马)，还有超过1/3的汽车零部件供应商。汽车产业的集聚，使这两个州发展电动汽车产业有得天独厚的条件，充电站的数量也随之增多。

其三、电力产业集聚。作为充电站主要建设者之一，电力产业的集聚也使当地充电站数量众多。北莱茵-威斯特法伦州是德国最大的发电企业EON和RWE的总部所在地。

电动汽车充电站典型建设模式

目前，德国电动汽车公共充电站主要有五种运营模式。

文/ 郭开怀 Article /Guo Kaihuai

Charging infrastructure construction is always the bottleneck of restricting the China's electric vehicle marketization, although the government attaches great importance to the construction of the charging infrastructure, but many people in the industry for the future profit model is still concern. Previously, China and Germany unified charging standard has made people begin to pay close attention to the development of electric vehicles in Germany. Germany as the world's automobile power country, in addition to the development of the traditional cars, Germany is at the forefront in the field of new electric vehicles. Thanks to the car free tax policy and the popularity of the charging infrastructure, the German sales of pure electric vehicle is relative high. German charging infrastructure construction experience, has a revelation and exemplary role, and worthy of reference and learning.

Charging station coverage in a high rate and to boost market development

Germany electric market development is rapid, high charging station coverage is an important reason. In recent years, Germany charging station is rapid growing and has reached 4454 sets in 2013. North Rhine-Westphalia state, state of Baden-Wurttemberg, Hesse and Bavaria are the largest four states in public charging stations in Germany. There have the following three aspects for increasing the states charging stations:

Firstly, the government support. The government guidance is an indicator of industry development. The above four states belong to the municipal government of Germany electric model states. In 2009 ~ 2011, the German government has earmarked 500 million euros to support, including to build charging stations, battery technology research and development, and city clean energy projects.

Secondly, automobile industry agglomeration. Baden-Wurttemberg and Bavaria have owned the first-class OEM (Daimler, AUDI and BMW), more than a third of the Auto accessories suppliers. Auto industry agglomeration, had made these two states have advantageous conditions for electric vehicle industry, also the increasing of charging stations.

Thirdly, the electric power industry agglomeration. As one of leading constructors of charging station, electric power industry agglomeration also had made more and more local charging stations. North Rhine-Westphalia is the headquarter of the largest power generation company EON and RWE in Germany

Typical construction model of electric vehicle charging station



其一、整车厂建设运营。整车厂为自己的顾客建立专属充电站，其中也包含合作商的充电站，但充电站仅为自己的品牌服务。

其二、独立供电商建设运营。采用订购模式，通常通过短信或预充值的冲点卡付款。

其三、供电商平台建设运营。由当地不同供电商合作，制定统一标准的平台，允许顾客使用彼此的充电站。

其四、公共供应商提供运营。包括便利店、超市在内提供配备充电箱的停车点，由于供应商众多，网点较丰富。

其五、个体运营。私人提供和出租自己的家用充电器。德国80%以上的充电站由整车厂和电力公司建造。参见图1：

定制化充电成为充电站新模式

充电站发展的最大阻碍是成本高。根据德国电动汽车国家平台(National Electric Mobility Platform)的调查计算，德国公共充电站中一根充电桩的投资费用为4700~9000欧元，一般一座充电站中有多根充电桩，加上后期的运营费、折旧费、人工费等，成本更高。

据计算，一家公共充电站盈利的起点，充电费用需达到每度1.18欧元才能盈利。然而，目前与汽油车燃料成本相当的充电成本为每度0.51欧元。德国公共充电站的电价只有每度0.21~0.29欧元，因此公共充电站很难仅通过充电业务盈利。

由于公共充电站普遍处于亏损状态，德国的供电商通过探索高利润率的定制化电动车充电业务来改善整体的盈利状况。以德国供电商巨头RWE的业务分布为例(见图2)，

其开展B2B与B2C的新业务。与投资公共充电站不同，B2B和B2C的业务中充电站的投资费用以及后期费用均由客户承担，供电商只进行建设、运营及维护等。由于利润更高，今后可能成为供电商重点发展方向。

德国经验值得中国借鉴

德国充电站的发展现状和经验，有启示和示范作用，值得借鉴和学习。主要有几点：

其一、政府扶持财政补贴是资金来源的保障，需要在车型和充电设施两方面同步推进。

其二、产业集聚将是建设充电设施的主要驱动力，供电商应该承担建设充电设施的主要工作。

其三、未来电动车快速发展，充电站可能会在汽车或电力产业集聚的地区优先发展。

其四、从长期看，充电站要解决盈利问题，不能单纯依靠政府补贴，更需探索各种盈利的新业务模式。

At present, the German electric vehicle public charging station mainly have five kinds of operating models.

Firstly, OEM construct operation. OEM is building the exclusive charging stations for their customers, which also includes the partners' the charging stations, but the charging station is only service for their own brands.

Secondly, independent power supply business construct operation. Adopt the ordering model, usually settle the payment via text message or the preloaded of blunt point card.

Thirdly, the power supply business platform construct operation. Cooperating by different local power suppliers to formulate unified platform, allowing customers to use each other's charging stations.

Fourthly, public supplier operation. including convenience stores, supermarkets, provided with charging box parking spots, because of many suppliers, the network is relatively abundant.

Fifthly, individual operation. Self provide and to rent their home chargers. More than 80% of German charging stations are built by OEMs and power companies. Figure 1:

Customized charging has become a new mode charging station

The biggest obstacle of charging station development is the high cost. According to Germany Electric car Platform (National Electric Mobility Platform) survey calculation, the investment for one charging pile of German public charging station is 4700 ~ 9000 euros, generally there are many charging piles in a charging station, including the operating cost, depreciation cost, labor cost, etc., in the late cost is higher.

According to the calculation, the starting point of a public charging station profit, If want to earn profits while the charging fees need to reach to about 1.18 euros per watt. However, the charging fees equal to gasoline fuel cost is 0.51 euros per watt. The electricity price of German public charging station is only 0.21 ~ 0.29 euros per watt, therefore public charging station is really hard to earn profits through charging electricity. Because public charging stations are generally in losing money situation, German power

suppliers to improve overall profits through exploring the customized business of electric vehicle charging high profit margins. Take German business distribution of big power suppliers RWE, for example (see figure 2),

To start B2B and B2C new business. Unlike with investing public charging stations, the B2B and B2C business investment costs and the late fees shall be borne by the customer, power suppliers are only responsible for construction, operation and maintenance, etc. Due to the higher profits, it may become the focus developing direction in the future.

Germany's experience is worthy of reference for China

The development present situation and experience of German charging station, has a revelation and exemplary role, and worthy of reference and learning. Mainly include:

Firstly, government support of financial subsidies is the guarantee of capital source, need to advance in the two aspects of models as charging and synchronization infrastructure.

Secondly, the industrial concentration will be the main driving force of charging infrastructure construction, power suppliers shall bear the main work of construction of charging facilities.

Thirdly, the rapid development of the future electric vehicle, charging stations may be priority to develop in the gathering areas of cars and electric power industry.

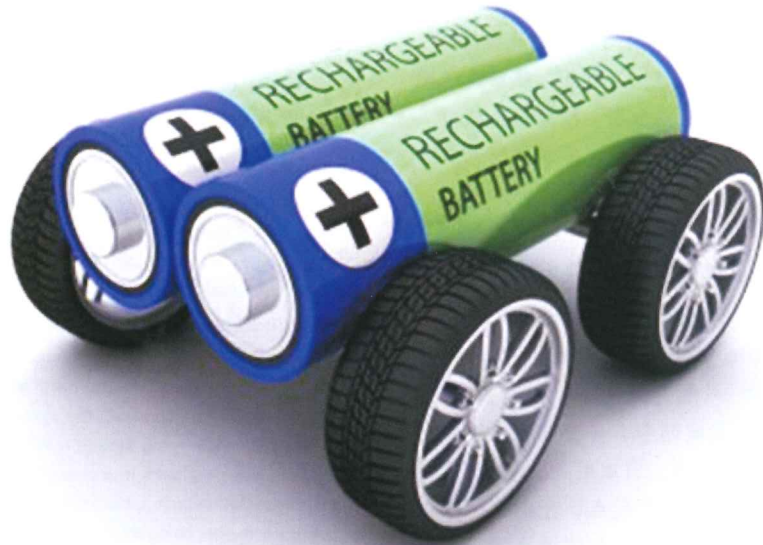
Fourthly, in the long term, charging stations need to solve the profit situation, it cannot only rely on government subsidies, but also need to explore all kinds of profitable new business models.



电池技术停滞不前 革新技术尚未出现

Battery technology stagnate Innovation technology has not yet appeared

文/ 李丹妮 Article/ Li Dan Ni



过去20年间发生的科技飞跃令人瞠目结舌。计算机已经从功利主义的盒子转变为由金属和玻璃组成的线条明朗的矩形，且小到能够放在口袋里，而且设备性能要强大得多，一款新型智能手表的计算能力比阿波罗登月飞船的都要强大。然而，电池是另外一回事！

为什么电池技术停滞不前？这是研究人员讨论的热门话题。很多人表示我们已经到达科学的极限。即便消费电子产品制造商，从苹果到三星，为了让设备拥有更长的电池寿命投资了上百万美元的科研资金，却无法在未来几年发生翻天覆地的变化。但这并不会减缓高度依赖电池的小配件数量不断上升的趋势。更遑论电动车动力电池！

科技进步的推动力

为了解讨论的问题，必须考虑电池制造商的过去、现在及未来面临的挑战。美国加州高级电池初创企业恩维亚公司的联合创始人和业务开发主管迈克尔·辛库拉(Michael Sinkula)发现1995年电池里存储的能量一直未发生特别显著的变化，直到十多年后2007年电池存储的能量才翻了一倍。自那时起，电池能量的增加从未超过30%。恩维亚相信到2021年大多数电池存储的能量可能都不会翻倍。

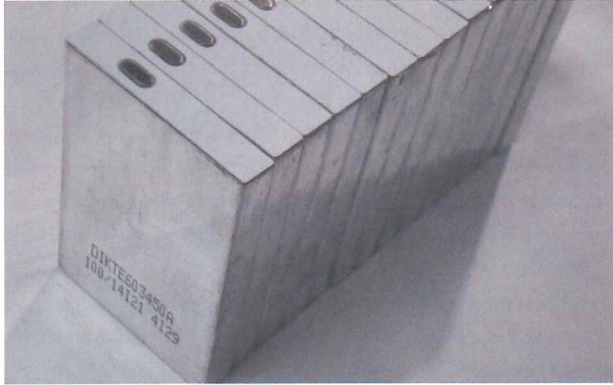
The rapid science and technology development over the past 20 years has surprised people.. Computers have already from utilitarian box of metal shifted to glass line anacreontic rectangle, and small enough to put in the pocket, and more powerful equipment performance, a new intelligent watches computing power is more powerful than the Apollo spacecraft. However, the battery is another thing!

Why battery technology stagnate? This is a hot topic discussed by the researchers. A lot of people say we have reached the limits of science. Even consumer electronics manufacturers, from Apple to SamSung, in order to make the devise has a longer battery life which had invested millions of dollars in research funds, but can't make big changes happen in the coming years. But this does not slow down the rising number trend of battery gadgets. But more about electric vehicle power battery!

The driving force for the progress of science and technology

In order to understand the discuss issue, must consider the past , nowadays, and future challenges of the battery manufacturer's. Advanced battery of California start-up well supplied the co-founder of Envia Ltd and the business development director (Michael Sinkula) had found battery energy storage has not been particularly significant changes in 1995, until ten years after in 2007 battery stored energy is doubled. Since then, the battery power has never increase more than 30%. Envia believe that most of the batteries store energy may not be doubled by 2020.

Science and technology progress is the result of two separate improvements: continuously to reduce the size of each part, and



科技进步源于两个单独的推动力：不断地缩小每一个零部件的大小和不断改善管理所有部件的软件。一台电脑的大脑是它的微处理器，芯片可以为绘制图片，或者辅助Facebook更新的文件进行必要的复杂计算。在过去的几十年，工业界一直在努力缩小处理器的体积。随着它们变得越来越小，它们所消耗的能量越来越少，因此电池寿命越来越长。但化学过程面临的问题是做得越小并不意味着变得越好。

此前，主要的电池发展都源于使用新材料。当材料从镍转化为金属锂后，消费性电子产品的电池寿命极大地延长了。磷酸锂之父、现代电池发展的一名重要科学家约翰·古德伊夫(John Goodenough)教授表示，现在的研究主要关注于改善锂电池的寿命。古德伊夫说元素周期表非常有限，因此进步和提升变得越来越困难。

与1979年古德伊夫宣布取得了突破性进展，使得现代电池变为可能的时期相比，现在研究电池的科学家数量明显增多，然而，可以试验和研究的新材料却已经匮乏。电池需要彻底革新的技术技，而这样的技术目前尚未出现。古德伊夫认为“延长电池寿命的下一个策略目前还是未知数。”

电池历史的漫长路

现代电池可追溯到18世纪，当时科学家们意外发现了一种处理静电的方法——将金属棒插入内部装满盐水、两端涂有箔层的瓶子。用一只手接触瓶子外部，而金属棒接触瓶子另一端，就能体验触电的感觉了。



constantly improve the management of all parts of the software. The brain of a computer is its microprocessor, the chip can make necessary complex calculate for drawing pictures, or supplementary Facebook update files. In the past few decades, the industry has been trying to reduce the volume of a processor. As long as they have become smaller and smaller, fewer and fewer power has been cost, so the battery life has become longer and longer. But the facing problem of chemical process does not mean that the smaller, the better.

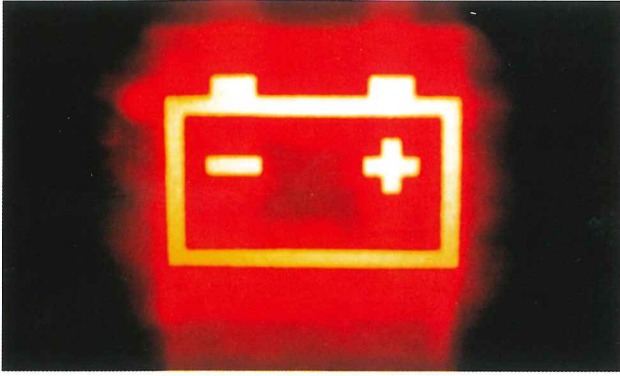
Previously, the main battery development comes from using new materials. When material from nickel into metal lithium, consuming electronics battery life has greatly extended. The father of Lithium iron phosphate, modern batteries in the development of a important scientist professor John Goodenough said research mainly focus on improving the life of lithium-ion battery. Goodenough said the periodic table is very limited, so progress and advance is becoming more and more difficult.

Compared with the Goodenough announced breakthrough progress of the modern battery has become possible in 1979, the scientists who study cells significantly increased by now, however, the new test and research of materials have already limited. Batteries need to overhaul technology, this technology has yet to appear. Goodenough thought "the next policy to extend battery life is still unknown."

The long history of the battery

Modern battery can be traced back to the 18th century, when scientists accidentally discovered a way to deal with static electricity, insert the metal bar inside the bottle filled with salt water, both ends with foil layer. With one hand contact outside the bottle, and a metal contact on the other side of the bottle, you can experience the feeling of electricity shock.

In 《the battery: a portable power supply has sparked a technology revolution》, Henry Schlesinger described how the scientists study



在《电池：便携式电源如何引发了一场技术革命》一书中，亨利·施莱辛格(Henry Schlesinger)描述了科学家们如何研究这种名为莱顿瓶的设备。其中非常著名的发明家是诗人珀西·比希·雪莱(Percy Bysshe Shelley)。年轻时的雪莱在妹妹的帮助下进行了实验。他还得到了妻子玛丽·雪莱的启发，后者在自己创作的小说《弗兰肯斯坦》里将电作为主要的情节设计。

就在小说《弗兰肯斯坦》出版后不久，安娜塔西欧·伏特(Alessandro Volta)发明了第一个被广泛使用的电池伏打电堆，就是在铜板和锌板中间夹上用盐水浸过的卡纸或布片，一层一层堆起来的蓄电池。

当今的电池并未发生巨大的变化。切开电池内部，可以看见由金属，例如锂制成的一种材料，和另一种材料(一般是碳)。两种材料之间是某种类似于伏特200年前使用的布片的物质——由液体或者胶体包裹的塑料，目的是防止金属发生相互作用，同时能够让原子自由移动。

当电池一端的金属丝与另一端的相接触，就产生了回路，电子会移动，从而产生电流，导致灯泡发光、立体音响发声或者锁上汽车车门。现在的电子设备，最流行的可充电电池锂离子电池已经被广泛使用了20多年，革新技术尚未出现。

电池市场的好风光

电池是科技的命脉。根据欧洲知名研究机构法国Avicenne Energy的估计，1990年，随着锂离子电池涌入市场，全世界对电池的需求高达20亿兆瓦时。这相当于444亿个劲量极限AA锂电池，足以环绕地球57次。截至20年后，也就是2013年，这一需求已经翻倍。

市场研究公司Lux Research预测截止2020年，仅用于

this device called Leyden jar. One very famous inventor is Percy Bysshe Shelley. When Shelley was young, he did an experiment with the help of his sister. He has inspired by his wife Mary Shelley, the latter one has mentioned the electricity as the main plot design in his creation novel of 《Frankenstein》.

Shortly after the novel 《Frankenstein》 has published, Alessandro Volta has made the first widely used batteries voltaic pile, was the water salted plate or paper put in the middle of the copper and zinc, a layer and a layer of pile up store battery.

Today's battery has not been have great changes. Cut off the battery inside, you can see a material made by the metal, such as lithium, and another kind of material (carbon) normally. Between two materials is a substance similar to v of cloth used 200 years ago – from liquid or gel package of plastic, the purpose is to prevent metal interaction, at the same time can let the atoms move freely.

When the battery end of the wire contact with the other end, it will creat a loop, electron moves, so as to generate an electric current, lead to a lamp lighten up, stereo sounds or lock the car door. The current electronic device, the most popular is rechargeable lithium-ion battery has been widely used for more than 20 years, innovation technology has not yet appeared.

Good prospect of battery market

The battery is the lifeblood of science and technology. According to the estimate of European well-known research institution in France Avicenne Energy, in 1990, with the entering lithium ion battery into the market, demand for batteries as high as 2 billion mw around the world. This is equivalent to 44.4 billion energizer limit AA lithium batteries, enough to travel 57 times around the earth. As of 20 years later, in 2013, the demand has doubled.

Market Research firm Lux Research forecasts by 2020, only use to drive the electronic device of the battery will cost up to \$26.6 billion, about 30% growth as in 2014. Most demands are from smart phones and pads, it is expected in the next six years both of them will increase by 45%. Batteries for transportation cost will be doubled, as much as \$20.9 billion.

Considering such large consumption, researchers are working to improve the battery life. Even so, few



驱动电子设备的电池花费将高达266亿美元，比2014年大约增长30%。大多数需求来自智能手机和平板电脑，预计两者在未来6年将增加45%。用于交通的电池花费将翻倍，高达209亿美元。

考虑到如此巨额的消费，研究人员正在努力改善电池寿命。即便如此，可以物质化的突破性进展寥寥无几。此外，几乎所有的主要研究首先都关注于在汽车和电网方面的应用。

科技巨头IBM在加州圣何塞的阿尔马登研究中心拥有一支专门研发电池技术的科学家小组。2009年，IBM投资50万美金要求几名研究人员开发Battery 500项目：旨在打造一块可以支持汽车跑500英里的电池，这意味着一次充电汽车就可以从旧金山行驶到洛杉矶，中途还能绕到沙滩上休息一会。这一项目的关键是所谓的锂空气电池(The lithium-air battery)，这种电池并不是依赖碳和其它金属，而是以锂离子为主，IBM和他的合作伙伴相信他们能够创造一种充满空气的容器，后者能够与锂发生相互作用从而产生电流。如果他们是正确的，那么这种空气电池的重量或可能减轻一半。但必须获得纯净的空气，需要机械装置净化空气。这意味着这将增加电池的大小、重量和复杂性。

其它的科学家，包括来自美国麻省理工学院和德克萨斯州大学的研究人员，都在考虑使用其它材料，例如硅、硫和钠。然而很多相关的研究和开发都是针对汽车设计。将这种技术应用于消费性电子产品可能还需要再等几年。

有些消极的科学家描绘了一幅较为悲惨的前景，他们认为我们已经达到了电池能力的极限。美国加州电池初创企业Imergy Power Systems首席执行官比尔·沃特金斯(Bill Watkins)则对电池的前景持乐观态度。他说：“从来都不要低估一群拥有足够科研资金的博士们的能力。”

breakthrough can be materialized. In addition, almost all the research first focused on the car and the grid applications.

Technology giant IBM's research center has a special battery technology research and development team of scientists in Almaden SAN jose, California. In 2009, IBM had invested \$50 million dollars to several researchers to research Battery 500 project. Aim to develop a Battery can support the car to run for 500 miles, which means that the car can drive from San Francisco to Los Angeles for one time charging, which can also round to have a rest on the beach at midway. The key of this project is the so-called lithium air batteries, The battery is not dependent on carbon and other metal, but is given priority to the lithium ion, IBM and his partners believe that they will be able to create a container full of air, which will be able to interact with lithium to generate electric current. If they are correct, then this kind of air battery may reduce the half weight of the battery. But it has to get the pure air, need mechanical device to purify the air. This means that it will increase the size, weight and complexity of the battery

Other scientists, including from the United States at the Massachusetts institute of technology and researchers at the Texas University, are thinking of using other materials, such as silicon, sulfur and sodium. However a lot of related researches and development are aimed at the vehicle design. It may need to wait for a few years to put this technology into consume electronics products application Some negative scientists paint a quite tragic prospect, they think we have reached the limits of the battery power. California start-up battery Imergy Bill Watkins, chief executive of Power Systems was optimistic about the prospect for the battery. He said: "never underestimate the abilities of a group doctors have enough scientific research funds."

