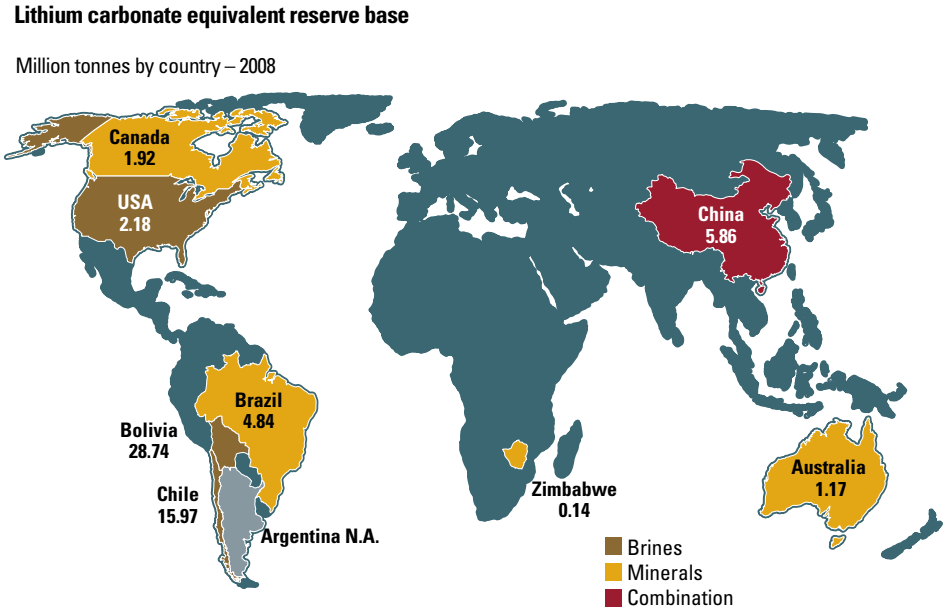
THE POWER GAME OVER POWER

Lithium is a scarce mineral, unevenly spread around the world. As the demand for battery power skyrockets, lithium is increasingly becoming a strategic asset in the market.



Definition: Reserve base – That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness and depth.

Source: USGS

▶ Batteries matter. A lot. This might come as a surprise, because, in a world of revolutionary technological change, progress in the battery world has been incremental for almost 20 years – since lithium-ion took over from the nickel-metal hydride cell (NiMH). But small improvements mean a lot in batteries – just ask Apple, which owes at least some of its device popularity to its long-lasting and reliable batteries. In a recent global study of mobile workers by iPass, 63 percent of respondents said they would choose a smartphone based on device battery life, ranking it second only to the operating system.

So, yes, batteries matter, and lithium looks to remain dominant for the foreseeable future. And in light of geopolitical concerns about the concentration of lithium reserves in South America, the explosion in lithium battery manufacturing for automobiles, and super-fast-charging and long-lasting lithium batteries in the pipeline, batteries could mean even more tomorrow than they do today.

From 7Up to the iPad

Lithium – an alkali metal in the same family as sodium – was officially discovered in 1817 by Swedish chemist Johan August Arfwedson. It is the least dense solid element and the lightest metal, only found in nature as a chemical compound, not a pure metal. It floats on water and is dangerously flammable in air and water.

Lithium has long been used as a mood-stabilizing drug in treating bipolar disorder, depression and mania, and was even an ingredient in the popular American soft drink 7Up in the early 20th century. Its first serious industrial use came during World War 2, when it was used as a high-temperature lubricant in aircraft engines.

Lithium-ion batteries took hold in the consumer electronics market in the 1990s, replacing NiMH batteries in many products. Lithium-ion batteries are lighter – weighing between 20 and 35 percent less than NiMH batteries – and more reliable. They also have little to no memory effect, meaning their performance does not fade much after long-term use, and they do not contain toxic materials, such as cadmium or mercury.

A question of geography

Lithium is mined worldwide but its heaviest concentrations by far are in South America. The majority of the world's lithium is mined from giant salt lakes in Argentina and Chile, and the top lithium producing countries in 2009 were Chile, Australia, China and Argentina, says Lithium Investing News. Production from these brines takes at least two years but results in a cheap, high-quality product. Lithium is also mined from a hard rock, called spodumene, a process that is quicker but more expensive.

As most developed countries look to reduce their dependence on foreign oil, many are turning to hybrid electric vehicles (HEV), which will be largely dependent on lithium-based batteries. This has transformed lithium mining and battery production into a hot political topic. In an industry dominated by a handful of mining companies, the most intriguing new sources of lithium are in Bolivia and Afghanistan.

Poverty-stricken Bolivia has the largest known lithium reserves – it has been called the Saudi Arabia of lithium – though its deposits are reportedly not easy to mine. And the Bolivian government – which has nationalized the country's oil and natural gas industry – is also keeping foreign companies at bay, seemingly determined to build a lithium battery industry from scratch.

Meanwhile, the US government recently announced that war-torn Afghanistan could be sitting on a USD 20 billion supply of lithium, creating debate over whether the money could

help rebuild the country or only lead to more fighting.

Lithium hits the road

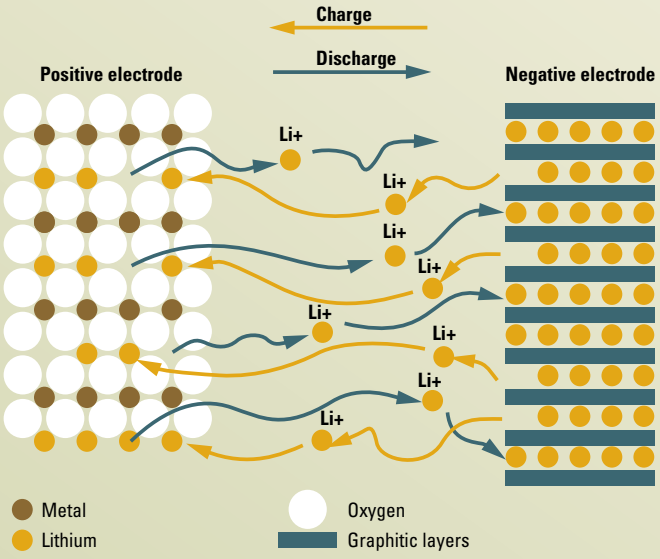
Long driven by consumer electronics and mobile devices, the lithium battery market is now focused squarely on the vast potential of HEV, with demand likely to double in the next 10 years and auto manufacturers wanting battery suppliers close by in their own countries.

The consumer market is a different story, highly competitive and with large unit volumes and price wars, says business research firm Frost & Sullivan. Market research company Freedonia says that in the US the overall battery market will reach USD 16.4 billion in 2012, driven by the rising use of consumer electronics and mobile devices. The main growth will be in lithium-ion batteries, with demand increasing 6 percent annually to USD 1.9 billion.

Within the existing market, South Korean battery makers – led by Samsung and LG – are on their way to overtaking long-dominant Japanese companies like Sanyo and Sony due to surging orders for mobile devices such as the iPad and iPhone – for which Samsung makes the batteries – and increased competitiveness due to a weaker currency.

For now the Japanese players are still on top, with 42 percent of the market in the second quarter of 2010, compared with 34 percent for the South Korean companies. But compared with the previous year, the Japanese share was up only 1 percent, while the South Koreans were up 6 percent.

The rechargeable-battery industry is also diversifying, as companies grow to meet the expected HEV demand. In the US, the federal government has passed a USD 2.4 billion stimulus plan solely for batteries and focused on automobiles, and new battery maker A123 is already the biggest producer in the US and could be one of "the best hopes for American manufacturing," says the EE Times, which covers the electronics industry. The Chinese government is making similar battery infrastructure investments.



"All lithium batteries function via the movement of ions back and forth between the electrodes. When the cell is charging, ions move from the anode to the cathode, and when [the battery is depleted and not charging], the ions move back to the anode again." Tim Feaver, CEO of Porous Power Technologies LLC, a company that makes lithium batteries, in online technology magazine ITBusiness.ca.

According to Time magazine, many of these new auto-focused suppliers may look towards consumer electronics as a way to keep plants busy and improve quality while they wait for the big auto order to materialize. Other observers are predicting a "battery bubble," arguing that HEV battery demand will simply not grow fast enough to meet this vastly increased capacity.

On the production side, the HEV boom is also shaking things up. Reuters says that while four major producers have long dominated lithium output worldwide, with demand likely to double in the next 10 years, there are opportunities for new players.

The fast future

There is exciting research in the lithium battery field, most of it related to cars. There has been talk of "lithium air" batteries that could hold charges for far longer than lithium-ion batteries, and in 2009 MIT scientists claimed they had discovered a way of recharging lithium batteries in seconds, rather than hours. According to Battery Power magazine, there is current research into silicon nanowire "forests" – which would replace carbon as the storage for lithium ions in the anode – that could increase battery life to 20 hours, up from two right now.

But Christophe Pillot, Battery Survey Manager at research firm AVICENNE Développement, told the electric vehicle industry's cars21.com in September 2010 that most of this type of research is still in the basic stages. He predicted battery life improvements in the "usual" range of 5 to 10 percent but also bemoaned the lack of any true revolutionary breakthroughs.

"It would be fun to have something new," he said. "It has been almost 20 years since the last really new invention in battery technology."

Cars get wireless charging mats

GENERAL MOTORS plans to incorporate wireless charging mats into car interiors. Starting with the plug-in hybrid electric Chevy Volt, drivers and passengers will be able to place phones and MP3 players on the center console to charge them wirelessly.

Fujitsu, Palm, Pure Energy Solutions and Green Plug are among the companies that have introduced wireless charging technology using tiny portable mats for a single device, desktop mats for multiple devices, and wireless rechargeable batteries.

3G base station on USB

FEMTOCELLS are seen mainly as domestic devices for improving indoor signal strength and offloading macro network traffic. Now, Picochip has demoed a 3G base station running on a USB dongle. Research firm Parks Associates questioned 6,100 people in six countries (China, Germany, Japan, Spain, the UK and US), and found that nearly 60 percent of broadband households with mobile phones were interested in femtocells.

Touch screens for all mobile phones

A UK-BASED company called Input Dynamics says that it can bring touchscreen and touchpanel technology to every mobile phone.

The company's technology, called TouchTap, needs to be mapped to a handset. It uses the phone's microphone to monitor tapping on a phone's screen and casing to enable various functions. It does this by monitoring the different sounds made from tapping different parts of a phone casing.

Input Dynamics says it plans to have an app available by the summer and that it will be hard-coded into some mobile phones by the end of the year.