The Battery Storage Race

Introduction

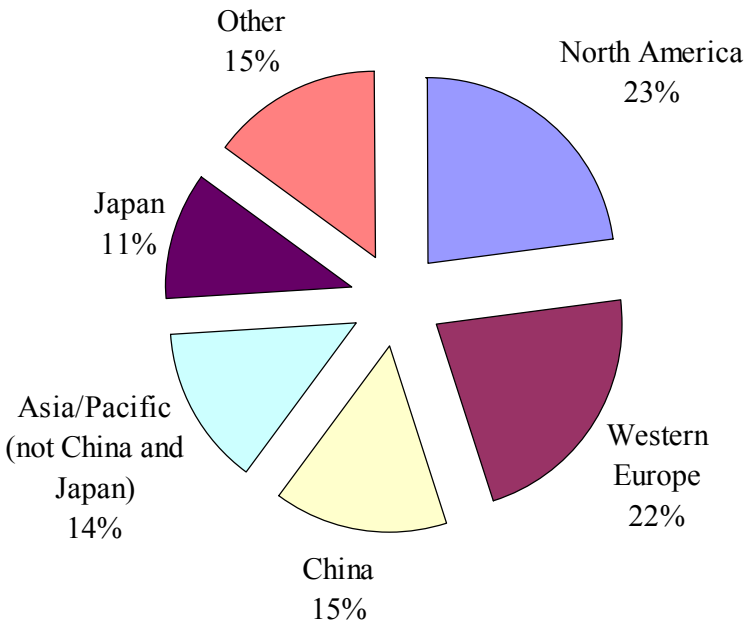
Worldwide, a range of cleaner energy technology types, such as the electric car and renewable energy, are waiting in anticipation for battery storage technology to improve. This is because longer lasting batteries are a key enabler for these applications. Organisations stretching from Sony to Toyota to Google have been active in the area of battery storage development, in 2008.

The most easily understood excitement around advanced battery storage is its application in cars. For cars, if appropriate battery storage technology can be realised, then potentially, millions of electric vehicles will be seen on the world's roads, helping to reduce the level of Green House Gas (GHG) emissions. Of course, the electric car would not be complete without an equivalent leap forward in charging technology. Here, utility companies might complete the loop. Still, the joining of the loop is dependent on battery technology meeting performance demand.

Market Size

World demand for batteries

It seems likely that trends applicable to the global market, such as trending towards electric cars, will drive battery development to reach new performance levels. The latest total value of world battery demand, for all types of design, was calculated to be USD $53 billion. The following Figure shows regional value share for batteries, in 2005.



Note: Figures are rounded

Source: The Freedonia Group/ECI

- According to the above Figure, in terms of monetary value, the largest battery demand was seen in North America, in 2005. This level of demand is reflective of the fact that North America is a well established and large consumer market. The value of the worldwide battery market has been forecast to increase by 7% per annum, through 2010.

- In future, the largest market share increase is more likely to be in China. This is based on the assumption that China will continue to benefit from economic growth, industrialisation, urbanisation and rising per capita income. Growth in value share is also more likely to be apparent in Eastern Europe, Latin America and Russia.

Technological Innovation

In this section, selected battery technologies in development are highlighted.

Metal-air cell design

- In 2008, there have been a range of new battery developments reported. For example, the Nikkei reported that Toyota established a new department for battery research which will focus on metal-air cell battery technology, for vehicles. The company hopes that the metal-air technology will outperform lithium-ion battery design. In the metal-air design, electricity is generated by a reaction between oxygen in the air and a metal at the negative electrode. It has been reported that an air battery has more than 5 times the energy storage capacity of a similarly sized lithium-ion battery. However, it has also been reported that the metal-air type do not perform well when constructed in larger sizes.

Flow battery storage

- Other cutting edge technologies exist. For example, in a flow battery design the storage unit is charged and discharged by a reversible chemical reaction. This reaction is between two liquid electrolytes, the electrolytes are not stored in the power cell of the battery, but in an external storage tank. More can be read about flow batteries here: http://www.leonardo-energy.org/drupal/node/2077.

Lithium-ion research leads the field

- Drawing on published material found in the Global Trends Database, it seems that lithium-ion batteries are the most likely avenue for achievement, at least in the short-term. In fact, lithium-ion is growing to dominate a number of portable rechargeable battery markets, and therefore, it seems reasonable that this type could naturally dominate in emerging sectors. However, it is worthwhile noting that there is potential use for dual energy storage systems which use a lithium battery and another technology, such as a pairing between a lithium-ion battery and super capacitors.

Anode and copper technology

- Copper's use in the development of battery storage is wide ranging. In order to offer an up to date view in this Trend Report, this section will focus on anode based development.

- With its high theoretical charge capacity, and low discharge potential, silicon is an appealing anode material for lithium-ion based batteries. However, silicon's volume changes upon insertion and extraction of lithium-ions, through charge and discharge cycles. In time, this change results in the capacity of the battery diminishing. Covering the silicon anode with copper creates a structure which provides a structure to accommodate the volume change.

- A company working in this field is Mitsui Mining & Smelting. The company "has developed a new silicon-based anode material called SILX which enables higher capacity and power in rechargeable lithium-ion batteries. The company plans to begin commercialization of SILX in 2010 through partnerships with battery manufacturers and Original Equipment Manufacturers (OEMs). According to Mitsui, the capacity density of a SILX anode is approximately twice that of conventional carbon-based anodes".

Renewable energy

- Developments in battery storage will also deliver the ability to use renewable energy technology to its full extent. Where energy is produced but not used, with appropriate battery storage, this excess energy will be captured for later use. The ability to capture energy for later use will be a turning point for distributed generation technology. This is because it will offer energy users what they have grown used to, that is convenience to draw electricity when and where they need it.

Further Reading

Articles about battery storage technology can be read by searching the Global Trends Database and using the word 'battery' in the search functionality. The website address is as follows: http://groups.diigo.com/groups/trends.