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Emerging Battery Technologies

EDNA15



The 4E Electronic Devices and Networks Annex (EDNA) provides policy guidance to members and other governments aimed at improving the energy efficiency of *connected devices* and the *systems* in which they operate. EDNA is focussed on the increased energy consumption that results from devices becoming connected to the internet, and on the optimal operation of *systems of devices* to save energy.

This briefing summarises the key findings of the EDNA report Emerging Battery Technologies. The objective of the report was to examine rechargeable battery technologies suited to powering consumer electronics. The report considers the relative performance, environmental impacts, cost and market readiness of both existing and emerging technologies.

Observations for Policy Makers

- Battery technologies must be invented or improved in order to supply this demand more efficiently than current technologies.
- Lithium ion batteries still prevail in consumer electronics and transport, despite large investments in other battery technologies.
- It takes a long time for new or improved battery technologies to reach the market – typically around 20 years.
- Those formulating policies should consider:
 - Allowing for future technology developments by adopting a technology neutral approach, where possible.
 - Focusing research on batteries which use scalable raw materials, or use only small amounts of 'critical raw materials' (materials of high importance to the global economy, that carry supply risks).
 - Limiting the life cycle environmental impact of battery usage through carbon footprint, recycling and circular economy approaches, and increasing battery lifetime through improved battery management systems.
 - Integrating ethical sourcing principles for resources such as rare earth minerals.
 - » Encouraging better battery technologies than lithium cobalt oxide (LCO) in small portable devices.



Battery demand (for consumer electronics)





ORE INFORMATION

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The EDNA report and further information is available from the EDNA website and by contacting the EDNA operating agent at steve@beletich.com.au

Key Findings

Problems with lithium ion batteries

Despite large research efforts, lithium ion battery technology still prevails in mobile devices and transport, mainly because this is a well proven technology.

The main issue with lithium ion batteries is the sourcing of materials. A shortage of battery raw materials is foreseen in the mid 2020s. Severe social, health and environmental impacts have also been reported in connection with the extraction of some of these materials (e.g. cobalt).

Lithium cobalt oxide (LCO) is an early generation lithium ion battery technology which began to dominate in portable devices in the early 2000s. Other lithium ion technologies such as lithium nickel cobalt aluminium oxide (NCA) and lithium nickel manganese cobalt (NMC) have now surpassed its performance and should be encouraged.

Emerging technologies

Research and development activities are underway for a wide range of new battery chemistries, especially adaptations of lithium batteries, including lithium metal anode, lithium sulphur, lithium solid state electrode, and lithium sodium. Non-lithium battery technologies such as silver-zinc are also being developed.



Supercapacitors provide higher power outputs for shorter periods. They have lower energy density and can be used to store an electrical charge with a reduced environmental footprint compared to chemical batteries.



'Carbon nanotubes' are an emerging technology claimed to increase battery power density by a factor of up to 10. This technology involves rolling a two-dimensional graphene layer into tubes to strengthen the battery electrodes and maximise their conductivity, thus increasing lifetime and charge/discharge rates. 4

The IEA Technology Collaboration Programme on Energy Efficient End-use Equipment has made its best endeavours to ensure the accuracy and reliability of the data used herein, however makes no warranties as to the accuracy of data herein nor accepts any liability for any action taken or decision made based on the contents of this report.