Q&A TUMIVolt Charging Station

Webinar series: TUMIVolt Charging Station
Title: Raw materials for global battery production - challenges and opportunities
Date: 19th March 2020
Available at: https://www.youtube.com/watch?v=HSLFBwklEAA
Contact: lena.stiller@giz.de

1. *I'd like to know if there's any kind of research to produce batteries with renewable materials/ sources?*

   A: X4D: Difficult to follow up the whole supply chain of primary minerals. For example, cobalt ore is mixed and comes from ASM and industrial mining.
   When it comes to recycling, the use of secondary minerals is still limited. Current recycling techniques do not allow 100% recycling and it is more expensive than using primary sources. The way batteries are assembled currently, makes recycling difficult. The individual minerals need to be separated before the recycling process.
   Links to studies:
   - *Ecological Recycling of Lithium-Ion Batteries from Electric Vehicles with Focus on Mechanical Processes* – Article in *Journal of The Electrochemical Society*, published January 2017
   - Current Developments and Challenges in the Recycling of Key Components of (Hybrid) Electric Vehicles – Article in *Recycling* 2016
   - Sustainability and Second Life: The case for cobalt and lithium recycling – IISD 2019
   - Circular Business Models for Extended EV Battery Life Article in Batteries 2018

2. *Two questions for any speaker: 1) Is cobalt, as a byproduct of nickel and copper mining, capable to significantly reduce the share of DRC in the world cobalt market? 2) What are the trends regarding lithium-ion batteries without cobalt (e.g., lithium iron phosphate batteries)? Can they change the current EV batteries supply chain?*

   A: It is difficult to completely replace cobalt from the DRC through other sources. Currently we are talking about a supply of up to 100,000 tons of cobalt from the DRC. The global demand is potentially growing to more than 200,000 tons annually in the next years. Other sourcing countries are not able to completely substitute the cobalt supply you find in the DRC. E.g. Australia where cobalt is produced together with nickel and copper, approx. 5,000 tons are produced annually. If you would upscale that you could maybe double the cobalt output to 10,000 tons a year. But even then, you are far away from the near-future 200,000 tons a year market requirement. Completely replacing cobalt from the DRC with cobalt mined in other countries would be theoretically possible but extremely expensive – the prices of batteries and EVs would increase accordingly. Furthermore, it wouldn't make much sense from an environmental perspective. The mines in the DRC have high copper and cobalt ore grades which means, compared to other countries, they generate less mine waste. Cobalt mined as a by-product of nickel in Indonesia or the Philippines, for example, is associated with significant environmental problems. Therefore, it is important to understand your supply chain and ensure responsible mining conditions no matter from which country the minerals are sourced.

3. *A question for Philipp: Due to the corona virus many mine sites are already going into care and maintenance. How is the situation in this regard in the DRC and how fast can production be re-started in order to not create supply shortages?*

   Several copper-cobalt mines in the DRC are controlled by Chinese companies and these often employ Chinese workers and managers. Due to the Chinese New Year and Fly-in-Fly-out work schedules, several of these might have been to China and are now subject to quarantine (or might not have returned to the DRC at all). If some mines recruit most of their workforce from China, this may lead to the mine being placed under care and maintenance. If a mine is under care and maintenance, it might take several weeks or months to get it up to full capacity again, but this depends on the individual mine. Ultimately, the production is controlled by the mineral price and company revenues versus operational expenditure. If demand and prices deteriorate too much (due to global economic impacts) mining companies may eventually decide to go or stay in care and maintenance until the market conditions are profitable for mining. It's also worth noting that it takes several weeks for trucking ore from the DRC to a South African port and then sailing the vessel with the ore to China. So both supply and price effects may be delayed.

4. *How can governments in the resource rich countries integrate best practice approaches to establish more sustainability in the resource deliver chains?*

   - Governments inspections on mines
   - Government responsibility: Fair payments and transparency in the revenue streams, to avoid corruption
   - Transparency initiatives like the Extractive Industries Transparency Initiative (EITI)
   - Industry scale mining: International mining associations like ICMM (self-regulating industry standards with sustainability frameworks)
   - ASM: Multi-Stakeholder management to establish responsibility standards
   - In general: combine governments, civil society and industry to formulate standards on what should be a responsible supply chain

5. *Is there some experiences or good practices on circular economy in the nickel sector?*

   First of all, nickel can be infinitely recycled without loss of quality. Also, nickel is with its 68% recycling rate amongst the metals with the highest recycling efficiencies. This means that more than two thirds of all nickel in consumer products can be recycled. However, here is still room for further efficiency. The industry plays a key role here. The amount of nickel going inadvertently into the carbon steel loop shows potential to be further reduced.

6. *What could be the best environmental strategy to reach an effective circular economy?*

   For the environment it would be useful to recycle and introduce a circular economy - no question. Mining and processing the minerals requires a lot of energy. Re-using minerals could reduce environmental challenges in producing and processing countries (but also shift some problems to others and create new ones).
   Establishing a clear recycling strategy is probably a combination of government legislations and private sector initiative. However, the dynamic in the market and further developments and improvements for battery technologies make it difficult to set up standardized recycling processes.
   So maybe think of alternative usage of batteries from e-vehicles: recycling could also mean to use batteries from cars in a different way for example for home energy storage.

7. *Supposedly, Tesla is committed to responsibly sourcing cobalt - how effective have these efforts been so far, by industry leaders such as Tesla and Apple?*

   There are other industry leaders that can be seen as examples for effective responsible cobalt sourcing: Samsung has excellent public reporting on their cobalt supply chain outreach. Several German car manufacturers have decided to support CSR projects in the DRC (implemented through GIZ InS) and/or have internal human rights monitoring schemes in place. Umicore operationalizes a sustainable procurement framework for cobalt. Importantly, when dealing with artisanal cobalt, it is important to take enough time to progressively improve conditions on the ground – this requires long-term efforts over several years. One cannot expect effective results after a week weeks or months. Tesla is using batteries with LFP cathodes, so they don't need cobalt. Apple tries to maximize recycling; cobalt recycling rates will indeed go up but not every company can rely 100% on recycling – substantial mining will still be required due to product life cycles and demand growth.

8. *Interested to know about the future of batteries - perhaps a good topic for a next webinar.*

   Future webinar topics will soon be announced.

9. *Johannes mentioned recycling potential towards 90% or cobalt. This seems high but also encouraging. How far away (in years) is this?*

   90% refers to the purely technically conceivable quota from a given copper-containing mass. The final recycling rate is calculated differently again, the value would then decrease.

10. *Former NPE (Nationale Platforme E-Mobilität) pointed out in its Battery Roadmap the trend of using Li-S. How does the Cobalt future demands have relation with this trend?*

    There are multiple trends on developing new batteries aiming to make them cheaper, safer, having more charging cycles, higher single-charge capacity for increased range etc. Cobalt is substituted out of batteries mainly due to its relatively high price. However, over the next 5-10 years, cobalt will still be used in batteries. On the one hand, this concerns batteries for portable electronics (which are still today's major market but will soon be overtaken by EV batteries). On the other hand, this concerns EV batteries with NCM cathode material. There is a trend to go towards high-nickel low-cobalt compositions or to use cobalt-free batteries (such as LFP) but, on average across the whole sector, there will still be some cobalt in the cathode material left, albeit less than today. But even though the average cobalt content in the battery will significantly decrease, this is more than compensated by the global growth of the battery market as a whole. Therefore, total demand for cobalt will increase over the next 10 years despite substitution effects and introduction of new battery technologies.

11. *How to handle batteries that have lost their useful life and what is the use of the second life of batteries?*

    Generally, when it comes to the question of waste from e-vehicles the motto is reduce, re-use, recycle (3R system).
    For example, the company Umicore has implemented recycling processes for electric vehicle batteries. Umicore has invested €25m into an industrial pilot plant in Antwerp to recycle lithium-ion batteries. In Europe Umicore has deals with Tesla and Toyota to use smelting to recover precious metals such as cobalt and nickel. Recycling of lithium requires further steps and is more costly. There is still a lot of room for improvement.

Studies like from the German Environment Agency (Umweltbundesamt – UBA) forecast a decrease in primary raw materials use in Germany by 2050 due to rising recycling quotas. Second life of batteries depends on the cost of the recycling process. Currently, the recycling process is way more expensive than the usage of primary minerals.

12. *Hello, I would like to ask: Lithium look like existing in a lot of countries why is the production only in China?*

	Mine production		Reserves[5]
	2018	2019[e]	
United States	W	W	630,000
Argentina	6,400	6,400	1,700,000
Australia	58,800	42,000	[6]2,800,000
Brazil	300	300	95,000
Canada	2,400	200	370,000
Chile	17,000	18,000	8,600,000
China	7,100	7,500	1,000,000
Namibia	500	—	NA
Portugal	800	1,200	60,000
Zimbabwe	1,600	1,600	230,000
Other[7]	—	—	1,100,000
World total (rounded)	[8]95,000	[8]77,000	17,000,000

Source: USGS 2020

As the chart shows, China has some lithium reserves. Biggest reserves can be found in Australia and in the Andean triangle (Argentina, Chile, Bolivia). Bolivia is not even in the list, because there is no comprehensive official data. However, reserves in Bolivia are estimated to be among the world´s top three.
China has invested a lot in lithium mines and reserves in other countries. Chinese companies have the financial capacities to do that, outperforming competitors, securing resources. Promoting e-mobility in the home market is one of Chinas political priorities. One result is a huge demand for battery minerals (i.e. lithium). China represents one of the largest and fastest growing markets for individual traffic in the world
China's vast manufacturing capacity and ability to sell lithium products cheaply has led to the country dominating the lithium product manufacturing industry.

Also follow us on:

https://twitter.com/TUMInitiative

https://www.facebook.com/transformativemobility