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before the

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Chairman Murkowski, Ranking Member Manchin, and Members of the Committee, my name is Mark Caffarey, and I am President of Umicore USA Inc. Thank you for holding this hearing and for providing the opportunity to testify on the critical topic of critical materials and the impact of COVID-19 on supply chain security.

Umicore is a global energy materials and recycling company, with nearly $4 billion in revenue,[1] 70% of which is from clean mobility (such as electric and fuel cell vehicles) and recycling. Of our 11,000 employees world-wide, approximately 500 are in the United States with facilities in ten U.S. states: Alabama, Massachusetts, Michigan, New Jersey, New York, Ohio, Oklahoma, Tennessee, Texas, and the U.S. headquarters in Raleigh, North Carolina.

Umicore is a leader in what is called the Circular Economy—the principle of keeping the value of products, materials and resources in the economy as long as possible without having to

[1] Financial figures can be found in Umicore's annual report here: https://annualreport.umicore.com/performance/key-figures

extract new resources. For many of the products we manufacture, we also prefer to collect them upon end of life in order to recycle the materials and use them again. While we understand that mining is still an important component to extracting materials, we believe that recycling will become increasingly crucial, as more and more technological innovation is deployed that requires these materials. Metals are infinitely recyclable, including those found in lithium ion batteries such as cobalt, nickel, lithium. Given the exponential deployment of lithium ion batteries alone, and the 10-50 times increase in the number of operating cells we predict by 2025 for rechargeable batteries, recycling will become important from an environmental and humanitarian point of view, and to the global integrated supply chain.

Umicore today is recycling end of life electronics, spent automotive catalysts, end of life industrial catalysts and other precious metals containing materials to recover and provide a new life to Au (Gold), Ag (Silver), Cu (Copper), In (Indium), Pb (Lead), Sn (Tin), Sb (Antimony), Pd (Palladium), Pt (Platinum), Rh (Rhodium), and other metals in a nearly half million metric ton yearly processing facility in Hoboken, Belgium. At the same site, Umicore introduced its environmentally friendly battery recycling technology in 2011 and is prepared to recycle critical elements such as Cobalt (Co) Nickel (Ni) and Lithium (Li) from portable lithium ion batteries, manufacturing scrap, and electric vehicle batteries once they reach their end of life. Currently, Umicore is recycling 7,000 metric tons per year of end of life lithium ion battery materials of various chemistries at this facility but plans to grow this recycling step in both scale and geographic scope. Umicore would like to expand its battery recycling capacities globally over the next ten years based on the needs of local markets. The current fraction of end of life batteries that is recycled in the United Stated is very low; the Department of Energy estimates it

to be approximately 5%.[2] Globally, every year the equivalent output of two large cobalt mines is "lost" because these batteries do not find their way to efficient and certified recyclers.

While Umicore's current recycling operations are primarily in Belgium, it is still possible for the originating country, such as the United States, to retain ownership of the critical and precious metals that Umicore processes. In this scenario, Umicore can act as a service provider and refine materials that another company owns for a fee. This allows companies to have access to our superior refining technology while not losing ownership of their materials. Presently, there are no companies in the U.S. or globally that can recover over 20 different metals from over 200 complex feeds.

According to a study by Kelleher Environmental,[3] approximately 350,000 electric vehicle batteries will reach their end of life by the end of 2020; that number is expected to grow to over one million by 2030. These batteries will contain large quantities of valuable critical minerals that should be recycled by certified recyclers. It is important that a policy and economic framework is put in place now while the volume of end of life portable and vehicle lithium ion batteries are relatively low so the industry and country can handle the massive number of these batteries in the next five to ten years. These policies are also necessary before Umicore and companies like ours are in a position to build recycling facilities that require economies of scale. While recycling cannot completely replace mining, it can complement it and be a sustainable supply of energy materials as the battery industry grows.

In addition to recycling end of life lithium ion batteries, Umicore is a leading supplier of

[2] https://www.energy.gov/articles/energy-department-announces-battery-recycling-prize-and-battery-recycling-rd-center
[3] https://bit.ly/3a8PcYj

cathode materials for rechargeable batteries used in electrified transportation, energy storage, and portable electronics. One out of five batteries manufactured globally contains Umicore rechargeable battery materials technology. This allows Umicore to be in a unique place in the supply chain as we are able to interact with both the beginning and end battery lifecycle. Our lithium ion battery operations are another example of our closed loop approach where we are able to manufacture and recycle the same materials. In the critical materials industry, it is common for refining, manufacturing, and recycling to cluster together geographically. This is true for Umicore as well as other companies.

Umicore manufactures countless other products. Specifically, Umicore is one of three global leaders in emission control catalysts for light and heavy-duty vehicles with our materials in approximately 1/3 of all catalysts in the global vehicle fleet. Umicore has a testing and development facility in Auburn Hills, MI in order to work closely with the Big Three auto companies on emissions control technology. Due to the economic impacts of COVID-19 on the automotive supply chain, Umicore was forced to close its automotive catalyst manufacturing facility in Tulsa, Oklahoma, unfortunately impacting approximately one hundred employees.

Finally, Umicore's electro-optic business unit manufactures germanium materials in Quapaw, OK. Germanium is an essential element to communications technology, high speed internet, and satellites. Umicore's germanium wafers were on the Mars Opportunity Rover and allowed it to have a lifespan far longer than experts predicted. Other wafers are installed on Low Earth Orbit satellites which is the foundation of an expanded internet and Space 2.0. We also provide the U.S. Department of Defense with germanium materials used in optics and infrared technologies.

Umicore supports the recycling components in the American Mineral Security Act, which seeks to ensure that the U.S. has a secure, ready, domestic access to critical materials required for defense and civilian high-technology products. Our nation's industrial scrap, end-of-life lithium ion batteries from cars and energy storage, electronics, and electronic appliances could provide nearly boundless valuable resources that could be recycled and put back into the economy. Recycling critical materials found in these products will avoid having to purchase materials mined in unreliable parts of the world and will provide a home-grown resource stream for those materials. For example, China and Russia provide nearly 70% of the world's refinery and production reserves for germanium while the United States is one of the largest consumers.[4] The recycling of germanium which Umicore does in Quapaw, Oklahoma helps offset the lack of natural sources for critical applications using germanium like 5G fiber networks and Low Earth Orbit satellites. In fact, Umicore recycles Germanium for the US Department of Defense. Furthermore, over 50% of the primary global cobalt supply is derived from the Democratic Republic of Congo (DRC). Local artisanal small mines have a history of human and environmental health and safety concerns. Umicore is the first company in the world to have introduced a Sustainable Procurement Framework for cobalt and is the first to obtain external validation for its ethical procurement approach in this area. However, if more lithium ion batteries with cobalt concentrations were recycled, the supply chain could rely more on sustainable cobalt from recycled sources as opposed to primary sources from the DRC.

Second, recovering metals from end-of-life products yields more material per ton than mining from primary resources. For example, for every ton of gold-containing ore taken from the

[4] See the USGS Mineral Commodity Summaries 2019 (pages 68-69) here: https://prd-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/atoms/files/mcs2019_all.pdf

ground through mining, on average less than five grams of gold can be recovered. By comparison, for every ton of mobile phones recycled, we can harvest up to 250 grams of gold, or approximately 50 times the yield from mining. For automotive catalysts, we can recover 400 times the yield in recycling for Platinum Group Metals (PGMs) than we harvest in mining. New electrification technologies—like electric vehicles and energy storage—provide markets for the increased need for battery materials. Electric vehicle sales increased over 80% from 2017 to 2018 in the U.S.[5] The number of vehicles sold in the U.S., however, was dwarfed by China which has 60% of the total electric vehicle market.[6] Bloomberg New Energy Finance increased its prediction of the adjacent energy storage market to $1.7 Trillion by 2040.[7] Granted, with reduced movement due to COVID-19, sales will potentially be less robust in 2020, but it is clear that over the longer term, the need for materials is only increasing.

Finally, the economic growth benefits of a domestic commitment to the recycling of critical materials could be enormous. The employment potential of a robust U.S. critical materials recycling industry is significant, involving not only a high number of jobs but also employment of varying skill levels at the first three stages of the recycling process: (1) the collection of discarded end-of-life products and scrap; (2) the dismantling and sorting of products and the separation of components; and (3) the pre-treatment of the separated components. Employment possibilities at the fourth stage, the refining (Umicore's business) of the pre-treated materials into the final critical material products, is limited due to the economies of scale needed to economically recycle these materials. In addition to primary jobs, indirect jobs

[5] See analysis here: https://www.greentechmedia.com/articles/read/us-electric-vehicle-sales-increase-by-81-in-2018#gs.bmvm7v
[6] See article in Detroit Free Press here: https://www.freep.com/story/money/cars/mark-phelan/2019/03/27/china-electric-vehicles-production/3217195002/
[7] Article from Utility Dive here: https://www.utilitydive.com/news/bnef-raises-forecast-for-global-battery-deployment-to-12t-by-2040/541541/

could include supporting services in IT, engineering, transportation, sales, administration, as well as research at universities and research centers.

Umicore believes the federal government has an important role to play in leadership as well as in research and development. Stakeholder collaboration, public-private partnerships, standards, and a systems approach, will be important to sharing information about these processes and what it will take to move toward more sustainable practices. Umicore is excited that the Department of Energy has taken a greater interest in these issues this year by launching the Battery Materials Recycling Hub at Argonne National Laboratory and supporting a lithium ion battery recycling prize competition, which will promote best practices for the collection and the initial processing of these critical materials. We are also optimistic that, because of this hearing and discussion, we can implement policies that open up new markets to recycling, create highly skilled jobs, and secure our critical resources for a clean, safe, and economically positive future for all.