March 4, 2020

The Honorable Paul Tonko
Chairman
Subcommittee on Environment and Climate Change
2125 Rayburn House Office Building
Washington, DC 20515

The Honorable John Shimkus
Ranking Member
Subcommittee on Environment and Climate Change
2125 Rayburn House Office Building
Washington, DC 20515

Re: March 4, 2020, Hearing on "Reduce, Reuse, Recycle, Reform: Addressing America's Plastic Waste Crisis"

Dear Chairman Tonko and Ranking Member Shimkus:

Thank-you for holding a hearing on the waste plastics crisis. As a small business entrepreneur that is focused on non-incineration technology solutions to waste materials, we have great confidence that with additional R&D, there is sustainable unsubsidized economic technology solutions.

The realities of the waste problem in the U.S. are shocking. A recent U.S. EPA report said that 35.4 million tons of plastics were generated in the U.S. in 2017, with only 8.4 percent recycled. This is a decrease of over half a percent from 2015. Another 16.4 percent were incinerated for energy and 76 percent were landfilled.

There is reason to be optimistic. Technology solutions needed to provide an environmentally responsible solution to the waste plastic and e-scrap crisis - are much closer than policy makers realize. This is a timely and significant opportunity for the U.S. to lead the world, create investment, jobs and exports.

Converting waste plastics and e-scrap into a source of non-CO_2 emitting hydrogen fuel, clean synthetic gas, and recovering the precious metals and rare earth elements (REEs) from e-scrap is not a pipe dream. Science, technology and engineering can deliver these outcomes with relatively small amounts of R&D.

It is timely to focus on advancing the ‘circular economy’ where more of our waste should become a resource for another process either as a by-product or a recovered resource for another industrial process, or as regenerative resources for nature. This regenerative approach contrasts with the traditional linear economy, which has a 'take, make, use, dispose' model of production. The traditional linear economy model that is in place today is no longer acceptable to society. With R&D, we can make significant progress toward the circular model.

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To this point, CHZ Technologies, LLC strongly supports leveraging U.S. R&D spending to enhance STEM and prepare the next generation with the capabilities to advance the circular economy. It is for this reason that CHZ Technologies LLC is collaborating with the Center for Environmentally Responsible Materials Recycling (CERMR), a 501(c)(3) nonprofit corporation dedicated to providing scientific and economical non-incineration technology solutions for environmentally responsible recycling and repurposing of end-of-life materials. CERMR, in cooperation with Youngstown State University (YSU), will conduct R&D that will be used as an educational and work-place skills development center for students and their preparation of entry into the workplace associated with end-of-life material recycling science and technology. A new YSU curriculum will focus on the science, technology and economics of end-of-life materials with the goal to place YSU at the forefront of addressing the global recycling environmental crisis.

Plastics are produced by using hydrocarbons as raw materials such as natural gas and, less so today, crude oil. So, it should not be surprising that plastics 1-7 have a very high energy content between 12,000 and 19,000 Btu's per pound, averaging 15,300 Btu's per pound. Gasoline has an energy content of 19,000 Btu's per pound, and natural gas has an energy content of 20,000 Btu's per pound. The circular economy calls for recovery of that energy content and convert it into a useful recycled energy source, all while safely diminishing the waste stream.

If it can be economically recycled into a usable plastic product – so be it. However, polymer molecular science makes clear that not large amounts of waste plastics can be reused and retain the performance characteristics demanded by the consumer market place and or compete economically with virgin material. And, when GHG life-cycle costs are considered, recycling looks even worse. Policy makers, consumers and environmentalists have a hard time accepting this chemistry reality.

Specifically, many plastics contain halogens that making conventional recycling physically impossible or uneconomic. Halogens are added to plastic polymers as a fire retardant and to enhance plastic performance characteristics. To recycle waste plastics requires heating them. Heat causes plastics to change their molecular composition, substantially reducing their usable performance characteristics and, if they contain halogens, they can emit dioxins and furans, which are toxic and expensive to destroy. Therein lies the challenge.

Plastics that contain halogens include, but are not limited to PVC piping, electrical wiring, electronic circuit boards, plastic housings, food wrapping films, tires, a significant range of plastic composites, and all the waste plastics that are polluting the oceans. Unfortunately, local recyclers cannot easily identify and separate halogen from non-halogen containing plastic materials.

For non-halogen waste plastics like water bottles, companies are considering blending the waste plastic with virgin material. The costs are higher and there is concern that when the GHG life cycle is considered, GHG emissions increase. The blending strategy works for only a small and narrow portion of all plastics.

Ocean plastics also have a very unique problem. When exposed to sunlight, salt water and constant wave action, the polymers oxidize and break down in a few months creating microplastic fragments that enter into the aquatic life food chain. The polymer structures of the collected ocean waste plastics are so damaged that they cannot to be recycled. Ocean plastics collected on the beaches or rivers by well-

intentioned civic groups can only be baled and sent to waste landfills – an unacceptable alternative to the circular economy.

Economics and GHG emissions are also a challenge for plastic recycling. Given the public demand for more plastic recycling, companies are investing in technology solutions that would potentially increase recycling. However, as mentioned earlier, to potentially reuse plastics requires heating them and cleaning them - and that requires large energy inputs that not only increase costs but increase GHG emissions. Plus, the GHG emissions associated with the collection, separation, and transportation of the waste materials must be considered. These higher costs and higher GHG emissions make recycled plastics more costly and less climate friendly than virgin plastic.

Electronic scrap recycle rates are only slightly better but none-the-less unacceptable. Industry data says the U.S. produced 6.9 million tons of electronic wastes in 2017, or about 12.5 percent of the world's volume. This volume is growing by greater than 5 percent annually and only about 17 percent is recycled.

Unlike plastics, e-scrap is still being shipped overseas. So, it is overseas entities, like China that are extracting the precious metals and rare earth elements (REEs), an outcome that does not make economic or national security sense. A robust domestic supply of REEs is critical to securing our national defense and national economic well-being, yet we are foolishly shipping it offshore when we should be recycling all of the e-scrap here in the U.S.

Recycling e-scrap and recovering the REEs is the fastest way for the U.S. to achieve REE independence. And, here again, an environmentally and economic technology solution is not far off through R&D.

Every one of the above challenges have a technology solution. As a country, we should be optimistic that through R&D, we can provide unsubsidized economic solutions to these serious and timely challenges. And, if we do, the U.S. can lead the globe in technology solutions to a world that is awash with waste materials on land and sea. Focusing on R&D and the 'circular economy' is the answer. Disruptive technologies that economically recycle these wastes lead to sustainability and a realistic circular economy. We look forward to working with you in support of advancing the circular economy.

Sincerely,

Ernest Zavoral
CEO
CHZ Technologies, LLC

Henry Brandhorst, Jr. Ph.D.
Managing Director
CHZ Technologies, LLC