April 14, 2021

The Honorable Jennifer M. Granholm
Secretary
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

Re: Notice of Request for Information (RFI) on Risks in the High-Capacity Batteries, Including Electric Vehicle Batteries Supply Chain; 86 FR 16343; DE-FOA-0002502

Dear Secretary Granholm:

The American Chemistry Council (ACC) represents a diverse set of companies engaged in the business of chemistry, an innovative, $565 billion enterprise. We work to solve some of the biggest challenges facing our nation and our world. Our mission is to deliver value to our members through advocacy, using best-in-class member engagement, political advocacy, communications, and scientific research. We are committed to fostering progress in our economy, environment, and society.

The business of chemistry:

- Drives innovations that enable a more sustainable future.
- Provides 544,000 skilled good paying jobs—plus over 3.9 million related jobs—that support families and communities.
- Enhances safety through our diverse set of products and investments in R&D.

Every year, the chemistry industry invests tens of millions of dollars to support product and worker safety. In addition to research initiatives, ACC programs focus on anticipating and preventing accidents, as well as educating the public about how to use our products safely. Chemistry makes it possible to satisfy a growing world population. Among other things, oe4ur products protect our food supply, deliver drinking water, ensure safe living conditions, and provide access to efficient and affordable energy sources and lifesaving medical treatments in communities around the globe. To enable these ongoing innovations, we advocate for public policies that support the creation of groundbreaking products to improve lives, protect our environment and enhance the economic vitality of communities.

The chemical industry – and innovations in chemistry – are critical to achieving efficient and effective climate change solutions. Many low-carbon solutions rely on innovations in chemistry – from high capacity batteries (HCBs) to high-performance building insulation and windows to lightweight plastic packaging and auto parts that reduce energy needs, and carbon emissions, in shipping and transportation. As a significant manufacturing sector, we are continuously improving the energy efficiency and intensity of our own operations. The chemical industry is developing transformational technologies that cut emissions, improve energy efficiency and enable a socially, environmentally and economically sustainable future. We are also committed to safe transport of hazardous materials, including HCBs, as evidenced by the important work of ACC's CHEMTREC division, which our comments detail below.

Free and Open Trade Strengthens Supply Chain Resiliency

Over the past four years, our industry has witnessed firsthand how trade policy uncertainty and the levying of high and broad tariffs on our imports and exports has disrupted the chemical value chain and the industries that rely on the business of chemistry. As a general matter, ACC advocates for the elimination and reduction of tariff and non-tariff barriers wherever possible. Reducing trade barriers is a better way to support production in the U.S. as opposed to the wielding of blunt trade instruments, which only increase uncertainty and costs and weaken competitiveness. We are also mindful that enabling greater U.S. production may require additional incentives from the U.S. and state governments. These incentives should be constructed in a way that does not distort trade and investment. As we have learned, when the United States implements trade actions such as tariffs, U.S. trading partners respond in kind, often retaliating against competitive U.S. exports, including chemicals.

We encourage the Administration to focus on what makes the U.S. chemical industry competitive. Factors of competitiveness include:

- Abundant sources of natural gas and natural gas liquids, the primary feedstocks and energy sources for manufacturing chemicals in the United States;
- Low cost imported intermediate inputs into manufacturing of chemicals;
- High skilled labor, including through immigration;
- Rule of law, including unbiased court systems that reliably and predictably enforce contractual commitments;
- Strong protection of intellectual property rights, including trade secrets;
- World class ecosystem for industry-university-government collaborative research & development and innovation; and
- High standard protections for human health, safety, and the environment.

By enhancing our competitiveness in the above areas, U.S. chemical manufacturers will be in a stronger position to produce more in the United States. Demand for the products of chemistry will increase in the U.S. over time but even more so in the rest of the world. In that regard, it is critical that the U.S. strategy on supply chain resilience prioritize opening new markets. Commercially meaningful new market access allows our companies to take advantage of economies of scale, thereby manufacturing more important chemistries at home in the United States and exporting more of those chemistries to the world. Enhancing our competitiveness will beget more competitiveness in the long run – and therefore greater supply chain resiliency.

And where U.S. trading partners are not playing by the rules and tilting the playing field in the favor of their domestic companies manufacturing HCBs and HCB materials, we urge the Administration to enforce U.S. trade agreements and U.S. trade remedies laws. Furthermore, we encourage the Administration to seek higher standards for environmental protection globally, so that chemical products, processes, and jobs do not move out of the United States into jurisdictions with weaker environmental protections.

Chemistry is Core to High Capacity Batteries (HCBs)

HCBs are crucial to modern life as they are used in everything from vehicles to mobile phones to cameras to pacemakers. Today the predominant HCB is the lithium-ion battery, which is a liquid-state battery. In the future, solid-state batteries may gain greater market share. Solid-state batteries that use innovative electrolytes promise greater energy density, conductivity, power, safety, and performance potential relative to lithium-ion batteries – at lower weight and cost.

The products of chemistry also help support other battery technologies. For example, bromine-based storage technologies are another electro-chemical energy storage solution, providing a range of options to successfully manage energy from renewable sources, minimizing energy loss, reducing overall energy use and cost and safeguarding security of supply. Typical bromine-based flow batteries include zinc-bromine (ZnBr2) and more recently hydrogen bromide (HBr). Other variants in flow battery technology using bromine are also under development. Bromine-based storage technologies are typically used in stationary storage applications for grid, facility or back-up/stand-by storage.

HCBs have the potential to power innovation in areas like the auto industry, energy generation and storage, and military applications. And they are critical to the future of U.S. energy security. But before any of these products can be produced, the constituent materials and chemistry must be shepherded through the process from design, to large scale production, to commercialization, and to mass marketing. U.S. chemical manufacturers play an important role in multiple stages of the battery supply chain:

- extraction of raw materials;
- concentration and purification of those materials;
- conversion of material into derivatives;
- manufacturing of derivatives into battery components; and
- recycling used battery materials to return them to high purities and grades for use in new batteries.

In this light, it is important to define the key components of HCBs that involve chemistry and the materials containing chemicals (see Table 1 below).

Table 1: Components of Lithium-Ion Batteries and Constituent Materials

Components	**Materials**
Cathode	Primary materials include lithium carbonate and lithium hydroxide. Cathode materials include lithium-metal oxides (i.e., lithium cobalt oxide, lithium manganese oxide, lithium iron phosphate, lithium nickel cobalt manganese oxide and lithium nickel cobalt aluminum oxide). In addition to these primary materials, minor additives (often called dopants or coatings) are critical to enhancing the performance of batteries.
Anode	Primarily natural and synthetic graphite (in the form of meso-carbon micro bead), but lithium titanate is also used. New materials include cobalt oxide, copper oxide and lithium metal alloys, as well as silicon-based systems.
Electrolyte	Include lithium salts (including lithium hexafluorophosphate, lithium hexafluoroarsenate monohydrate, lithium perchlorate, lithium tetrafluoroborate and lithium trifluoromethanesulfonate (lithium triflate) in an organic solvent (including ethylene carbonate, dimethyl carbonate, and diethyl carbonate, ethyl methyl carbonate, propylene carbonate, diethyloxyethane, dioxolane, γ-butyrolactone, and tetrahydrofuran), and other electrolyte salts
Separator and separator coatings	Aramid film, polyethylene, polypropylene, polyethylene terephthalate, fluoropolymers

Absorbent for electrolyte and electrode separator	PVDF copolymer film, which is used as a binder to bind lithium compounds and graphite to their respective electrodes; fluoropolymers
Battery Pack Insulation	Polyphenylene sulfide film and polyetherimide film; silicones.
Packaging	Polycarbonate, polypropylene, and polyamides

Flame Retardants

Flame retardants are a critical safety component because electronics have a variety of potential ignition sources generated by the essential components of the product, including circuit boards, batteries, wiring, fans, connectors, and even plugs. One of the most important benefits of flame retardants in product design is they can stop small ignition events from turning into larger fires. Electronic products are unique because they have a potential ignition source generated by the essential components of the product, including batteries. Batteries can overheat, and circuit boards and other device components carry electric currents; therefore, many electronic products present a higher risk of flammability than some non-electronic products. Flame retardants help to reduce the risk of fire and are essential for ensuring manufacturers meet fire safety standards.

Plastics and Polymer Composites

Plastics and polymer composites offer an unparalleled combination of properties that are essential to the mobility solutions of the future and modern innovations that benefit people's health and well-being, conserve natural resources, and reduce the impact on the environment. Plastics and polymer composites have the flexibility to enable batteries to be integrated safely and seamlessly into vehicles without adding extra weight. Polymer materials are lightweight, corrosion-resistant, and thermally conductive - enabling battery pack assemblies and battery pack protection during impact events – while at the same time, helping increase battery range on a single charge, extend battery life, and offset the significant added weight that comes along with electric and hybrid vehicle designs.

Global Demand for HCBs - and their Constituent Materials - is Poised to Skyrocket

The electrification of the transportation sector and integration of renewable energy sources into the electricity system is causing global demand for batteries to skyrocket. For example, 300 to 500 million electric vehicles are projected to be on the road around the world by 2040, driving HCB demand to grow an estimated 15-fold by 2028, as compared to 2016 levels[1]. In response, China, Japan, South Korea, and European countries are taking massive strides to meet material and technology needs by investing in the battery supply chain. Above all others, China has a commanding lead over the market with over 100 battery megafactories built or planned, ownership of more critical mineral reserves than any other country, and a stranglehold on the world's mineral processing industry.[2] Conversely, the U.S. has plans for only 9 battery megafactories, and is projected to control less than 10% of the global battery supply chain by the end of the decade.[3]

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[1] Securing America's Future Energy, "The Commanding Heights of Global Transportation." 2020. Institute for Defense Analyses, "Lithium-Ion Battery Industrial Base in the U.S. and Abroad." 2019.
[2] SAFE, "The Commanding Heights of Global Transportation." 2020.
[3] Benchmark Minerals Intelligence, "Benchmark Summit 2020." 2020.

Increased HCB Manufacturing in the U.S. Would Offer New Supply Opportunities for U.S. Chemical Manufacturers

Many of the above materials are used by multiple downstream sectors and subsectors, including by companies manufacturing HCBs. If U.S. and global HCB manufacturers decided to build new HCB plants in the United States, demand for these chemistries could increase significantly, meaning that production and supply of HCB materials will also have to increase in order to meet demand by HCB manufacturers and other downstream sectors and subsectors that also rely on these materials. Furthermore, demand for HCBs across the world is estimated to increase exponentially as businesses and consumers move towards electrification. Specialty chemicals are an important part of the HCB supply chain and efforts by the U.S. Government to increase domestic HCB production should account for follow-on impacts to other industry sectors and the entire supply chain for each affected chemistry.

U.S. Tariffs Limit the Supply of Important Inputs for the Manufacturing of Chemistries Relevant to HCBs

A straightforward way to incentivize U.S. production of chemicals relevant to HCBs is to provide relief from tariffs. ACC encourages the Department of Commerce to work with the Office of the U.S. Trade Representative to identify the relevant intermediate inputs exposed to most-favored-nation customs duties and additional tariffs under Section 301 of the Trade Act of 1974. Quick Congressional renewal of the Miscellaneous Tariff Bill may provide temporary suspension or reduction of the MFN duties imposed on imports of intermediate inputs. Furthermore, if they are also subject to additional tariffs under Section 301, USTR may be in a position to exclude these intermediate inputs from the China Section 301 tariffs. Avoiding the payment of MFN duties and additional tariffs of up to 25 percent under Section 301 will help U.S. chemical manufacturers respond quickly to increased demand, instead of paying tariffs on inputs.

Incentives May be Necessary to Increase U.S. Production of Chemical Inputs for HCB Manufacturing

Clearly, the United States is facing myriad national security, economic, and environmental challenges at home and abroad. HCBs will play a critical role in meeting those challenges. To ensure that U.S. chemical manufacturers are in a stronger position to meet the increased demand for HCBs in the United States and globally, we encourage the Administration to consider appropriate incentives for producing the necessary minerals, materials, and technologies in the United States. The right mix of incentives will strengthen the business case for producing the constituent materials for HCBs in North America. A strong North American supply chain for HCBs will therefore strengthen the U.S. defense industrial base, grow high-value, high skilled jobs, address important environmental objectives (e.g., reducing greenhouse gas emissions), bolster U.S. technology and innovation leadership, and provide support for U.S. trading partners and allies.

Although the need for massive investment in production of battery materials is clear given the growing demand, the business case for where to produce chemistries relevant to HCBs is dependent upon many factors. The U.S. government and state governments could help solidify that business case by considering additional ways beyond tariff relief for incentivizing chemical manufacturers to increase production or build new facilities in the United States. Because the significant investments in building manufacturing capabilities takes years of planning and development, these incentives must be in place promptly in order to drive decisions for future production.

Such incentives could include:

- Tax credits and abatements;
- Expedited permitting for plant construction or upgrading;
- Timely review and approval of new chemistries under TSCA;
- Programs to educate the workforce in response to industry needs;
- Facilitation of high skilled immigration;
- Access to worker training/retraining programs;
- Public-private partnerships for research and development of new materials and technologies; and
- Potential cost-shared grants to support domestic capital investments for key upstream materials, including chemical inputs, as well as infrastructure; and
- Relief/insurance for domestic supply chain disruptions, e.g., hurricanes, wildfires, and winter storms.

Supply security may also be supported by cooperation and support under the U.S.-Mexico-Canada Agreement (USMCA). Materials supplied by USMCA partners would be expected to flow more freely without restrictions and security risks.

Building Domestic Capacity for Recycling of HCBs Is Also Important to the U.S. Economy

Recycling and recovery of minerals contained in batteries, such as lithium, cobalt and nickel, is developing and will play a critical role in the security of supply for these materials, and will also contribute to a circular economy that is more sustainable for electrification. Historically, recycling of lithium and lithium-ion batteries has been limited due to dispersion in end-use devices and the high cost of collection, recovery, separation, and re-purification. Given the projected increase in electric vehicles, however, battery recycling rates should increase in part due to vehicle battery recycling systems already in place for lead-acid batteries.

But the Administration should not take recycling for granted. It is critical that the Administration view the battery supply chain holistically and incorporate a circular economy approach into its analysis and any recommendations. Greater recycling will alleviate the need for extraction of lithium and other materials, lessening environmental impacts. U.S. chemical manufacturers are using and developing advanced chemical processes to recover materials in batteries and concentrate and purify used battery materials, include lithium, to high battery grade standards. Ensuring that HCB recycling can stand up, become commercially viable, and grow should also be an essential goal for the Administration.

U.S. Regulation Also Impacts Chemicals Relevant to HCBs

As the Department of Energy reviews risks to the HCB supply chain, it would be important for it to explore with U.S. government agencies ongoing regulatory initiatives and actions relevant to the chemistries described below. In order for HCBs to meet the ever increasing performance demands, new chemistries must be advanced that decrease charging times, increase output and thus increase battery range, extend battery life and maintain safety (see detailed description below). These new chemistry technologies must be able to be brought to market quickly in order to compete globally. U.S. government agencies such as EPA, which has authority under TSCA to review the risk of new chemicals in commerce, must therefore be prepared to review new chemistry, assess risks, and approve them in a timely manner.

Many critical components of batteries (and certain substances used to make them) are manufactured outside the United States. Both the import of those components and development of a domestic supply chain by those seeking to manufacture in the U.S. are facing significant regulatory barriers under TSCA. For example, although some new cathode materials have chemistries similar to those already approved by EPA, they are nonetheless assessed *ab initio* as novel chemistry by staff reviewers afforded little opportunity to build up relevant expertise or leverage prior agency reviews. In addition, an industry willingness to accept EPA consent orders imposing conservative worker safety/risk management measures, in the hopes of accelerating agency approval of domestic manufacture, have had no apparent impact on the speed of regulatory review. This can result in unexplained regulatory approval delays of 2-3 years in some cases. The lack of a domestic battery materials supply chain could be an obstacle as battery demand increases, and its development is hindered by these regulatory challenges.

Fluorinated Chemistries

Fluoropolymers enable advanced energy storage and conversion technologies and are key components of lithium ion batteries. They offer unique performance benefits over other energy storage materials due to their innate resistance to high operating temperatures, chemical corrosion, and abrasion. They enable battery systems that are more efficient, consistent, and durable. Fluoropolymers are also essential chemical technology for flow batteries, which allow utilities and building and home owners to store energy for use at more optimal times, and play critical roles in renewable energy production and overall grid management. Standard appliance batteries (dry cells) and lithium battery cells use short-chain (c6) fluorosurfactants as a corrosion inhibitor at the electrodes.

An additional key point that could significantly and negatively affect the domestic battery supply chain is an overlybroad definition of per- and polyfluoroalkyl substances (PFAS). Certain overly broad definitions of PFAS will capture fluoropolymers themselves – products that are essential to the manufacture of lithium ion batteries. Indeed, lithium-ion batteries cannot be manufactured without fluoropolymers. In other words, unnecessary and inadvertent restrictions on fluoropolymers that would result from of an overly broad PFAS definition would have a catastrophic impact on the domestic EV battery business.

TSCA approvals for imports and domestic manufacturing

Modern Cathode Active Materials (CAM) consist of lithiated mixed metal oxides, commonly referred to NCM (Ni, Co, Mn-based) and NCA (Ni, Co, Al-based), *cf*. Table 1. There are also other material classes under development, namely Co-free variants. While these base materials have been investigated in the last decades, modern material developments target optimization of those materials for specific purposes, e.g., automotive application in electric vehicles. Typical optimization parameters include energy density, safety and long term stability during cycling (charging/discharging of the battery). There are complex material strategies, all of which build upon partial replacement of a few atoms in the crystal lattice by other elements, a process called doping, e.g., replacement of Mn by Al in NCM. Furthermore, CAM particles made of NCM or NCA can be treated with a coating of another material after calcination, e.g. resulting in an aluminum oxide layer surrounding the NCM core particle. Most, if not all, future CAM contain both, doping and coating, often using more than one additional element, to stabilize the material in the application.

It is important to note that the intrinsic material properties as well as the hazardous characteristics of NCM or NCA remain unchanged by these modifications. It is foreseeable that a variety of new combinations will be developed with short time-to-market requirements. This fundamental principle of doping and coating also applies to other basic cathode active materials like the Co-free materials mentioned above. Based on the arguments laid out in the EPA guidance document regarding formulated and statutory mixtures (“Products Containing Two or More Substances, Formulated and Statutory

Mixtures on the TSCA Inventory"), doped CAM may be regarded as statutory mixtures without the need for new PMN notifications.

CHEMTREC

CHEMTREC was established in 1971 by members of the American Chemistry Council as a 24/7 emergency response information center. Located in Falls Church, Virginia, CHEMTREC's mission is to provide accurate chemical information to emergency and hazmat incident responders quickly to mitigate the impact of transportation related hazmat and chemical emergencies. Since then, CHEMTREC has emerged as the premier "Level 1" Emergency Response Information Provider (ERIP).

As a public service, CHEMTREC operates under a Memorandum of Understanding with the U.S. Department of Transportation (DOT) to provide emergency response information for all incidents involving a hazardous material or dangerous good to all emergency responders - no matter who has responsibility for the hazardous material or dangerous good.

Lithium batteries are regulated as a hazardous material under the U.S. Department of Transportation's (DOT's) Hazardous Materials Regulations (HMR; 49 C.F.R., Parts 171-180). CHEMTREC supports the safe transportation of lithium batteries throughout the global supply chain by offering a host of tools to help comply with the current regulatory requirements. Specifically, CHEMTREC offers the following tools to help mitigate risk and increase safety confidence within the supply chain:

- Training: CHEMTREC recognizes the need for proper education before handling, packing, shipping, or transporting lithium batteries. CHEMTREC provides training that meets the U.S. DOT training requirements (49CFR§172, Subpart H) which covers excepted and fully regulated batteries.
- Test Summary Management: To help ensure safety, DOT's Pipeline and Hazardous Material Safety Administration (PHMSA) requires lithium battery and cell manufacturers to comply "to appropriate UN design tests to ensure they are classified correctly for transport, and to develop records of successful test completion, called a test report" (49CFR Parts 171-185). This rule has an implementation date of January 1, 2022. In response, CHEMTREC offers CRITERION®, a document management system for lithium battery test summaries. This program allows CHEMTREC to accelerate the flow of information between stakeholders allowing them to easily acquire, build, manage, and distribute thousands of battery and product test summaries in one simple solution.
- Emergency Response Information: CHEMTREC provides lithium battery shippers a method to comply with the U.S. DOT requirements (49CFR§172.604), providing a 24-hour emergency contact on all hazardous material shipping documents. With the CHEMTREC emergency contact number the industry has access to toxicology and medical specialist, language interpretation services, and a chemical industry professional to help through the emergency response process in the event of an incident involving a battery. Providing this additional layer of support to anyone within the supply chain helps limit potentially negative encounters with a battery product.

Conclusion

U.S. chemical manufacturers, our customers, and workers have benefited from global supply chains and also recognize that risks arise and must be mitigated. We welcome the Biden Administration's focus on risks to the HCB supply chain, of which the business of chemistry is a vital part. In the Department of Energy's review, we encourage a holistic examination of risks that includes trade policy and regulation.

Robust interagency and stakeholder consultation will be key to arriving at effective recommendations that are fit for purpose and support free and open trade and investment. ACC is ready to serve as a source of information and experience regarding the role of the business of chemistry in enabling production of HCBs in the United States.

Sincerely,

Ed Brzytwa

Director for International Trade
American Chemistry Council