American Chemistry Council

February 28, 2022

To: The Honorable Jennifer M. Granholm
Secretary
U.S. Department of Energy (DOE)
1000 Independence Ave SW, Washington, DC 20585
Industrial-Decarb-RFI@ee.doe.gov

From: Charles Franklin
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Re: Industrial Decarbonization Priorities (DE-FOA-0002687)

Dear Secretary Granholm:

On behalf of the American Chemistry Council (ACC) and its members, I am pleased to submit the following response to the January 27, 2022, Request for Information (RFI) on Industrial Decarbonization Priorities (DE-FOA-0002687). ACC represents a diverse set of companies engaged in the business of chemistry, an innovative, $486 billion enterprise. ACC members work to solve some of the biggest challenges facing our nation and our world, driving innovation through investments in R&D that exceed $10 billion annually.[i]

American chemistry has a critical role in driving down our nation's carbon emissions by supplying chemical products and inputs needed to advance our nation's sustainability and carbon reduction goals. Indeed, the business of chemistry is integral to most if not all the current and future decarbonization solutions needed to reach the Administration's economy-wide carbon emission reduction goals.

Our members also are taking action to reduce the industrial greenhouse gas (GHG) intensity of their own supply chains, operations, and products. From 2017 to 2020, ACC's reporting members have reduced their GHG intensity by approximately 10 percent. Many ACC members have set emission reduction targets and goals and are implementing strategies to make meaningful reductions.

Achieving continued reductions across the industry will not be easy. A comprehensive carbon mitigation strategy should consider product emissions and sinks from across the lifecycle, including upstream fuel and feedstock emissions, manufacturing process emissions, energy emissions from fuel and steam, energy emissions from electricity, avoided carbon during the use phase, and end-of-life or recycling phases. Each of these carbon reduction levers raises novel technology and logistical challenges. Moreover, even where technologies have been demonstrated for a particular application or industrial segment, translation and validation of that technology at commercial scale and proliferating it across industry can take decades to implement. Decarbonization of the economy will require expanded use of existing carbon reduction strategies as well as innovative new strategies.

Our members are eager to work with DOE, the Administration, and Congress to support successful implementation of the Infrastructure Investment and Jobs Act and other research and funding authority. ACC is pleased to join and support industry engagement through this proceeding, other RFIs, and direct dialogue to optimize federal and private investment in the critical research, development, and early deployment activities needed to bring these technologies to at-scale, economically viable commercialization.[ii]

***Question C1.1* What emerging decarbonization technologies could have the most impact in the chemical industry over the next 5-10 years, and 10-20 years?**

DOE's question highlights a challenge for manufacturers and policymakers. The chemical sector does not reflect one type of company or industrial process. It is a collection of many subsectors producing thousands of unique product chemistries, each with different feedstocks, energy inputs, sites, manufacturing technology requirements, and emissions profiles (e.g., power versus heat versus process emissions). Across this endless array of products, manufacturers face unique constraints in modifying products and operations.

ACC is working with its members to identify carbon reduction strategies, infrastructure needs, and critical research and policy elements needed across the value chain. But there is no single silver-bullet technology, either within or across chemistries and production processes. The solutions suitable for building block chemical production, for example, will differ from those suitable for production of intermediates, derivatives, and end-use chemical and polymer products.

In short, a successful industrial decarbonization research agenda will need to support a diversity of solutions reflecting the diversity of the chemical sector. These include renewable and low-carbon electricity, fuels, and feedstocks, circular feedstocks (e.g., chemical recycling), process electrification, combined heat and power and other energy efficiency innovations, carbon capture, utilization, and storage (CCUS), and innovative new chemistries and materials to enable and optimize performance.

ACC will defer to its members to address questions on the specific needs and priorities within the seven production streams listed in the RFI (and others) and the technologies that are likely best situated for early action. Below, ACC highlights a number of cross-cutting chemical industry priorities and recommendations for future action.

A. Combined heat and power (CHP)

The chemistry industry is a leader in the use of CHP, a highly efficient process for generating heat and electricity on-site. Looking forward, DOE has estimated the potential for over 73 GW of potential new capacity across more than 50,000 industrial sector sites. Almost one-third of this additional potential capacity comes from the chemical sector. DOE can play an important role in achieving these gains.

ACC Recommendations:

1. Incentivize research and innovation to increase the efficiency and reduce the cost and footprint requirements for CHP retrofits.
2. Support research, development, and deployment (RD&D) projects for emerging CHP technologies at a broad range of facility types and sizes.
3. Work with ACC to educate its members about the AMO's current suite of resources designed to foster greater industry adoption of CHP.
4. Lift the 20-MW cap on CHP deployment incentives.
5. Expand DOE's CHP Program, Better Plants, and Plastic Innovation Challenge.

B. Renewable energy generation and advanced battery storage

Renewable energy generation and advanced battery storage will be essential and inseparable components of the chemical industry's emission reduction strategy. Chemical manufacturing is inherently energy intensive, requiring both heat and electric energy at quantities that exceed the supply and capacity of today's renewable energy generation, storage, and infrastructure capacity. Even without any changes to manufacturing processes, transitioning the industrial electrical grid to renewable generation will require unprecedented investments in new renewable generation, transmission, and energy storage infrastructure, as well as new innovative technologies and materials to decrease the cost, increase the efficiency, and ensure the 24/7 reliability of supply to industrial users.[iii]

The transition to low-emission industrial manufacturing technologies and strategies (carbon capture, cracker electrification, etc.) will increase 24-hour demand for reliable electricity even more. ACC's members will be important partners, supplying many of the current chemical and material technologies used in renewable generation, transmission, and storage used today, while developing the innovative new chemistries and materials needed for the renewable and low-carbon energy and industrial sectors of tomorrow.[iv]

ACC Recommendations:

1. Prioritize RD&D of energy storage, including advanced battery systems, to support industrial power needs.
2. Expedite renewable energy infrastructure siting, permitting, and construction.
3. Use new funding authorities to incentivize research, development, and demonstration of innovative new chemical and material technologies that can improve the efficiency, performance, cost (capital and operating), and reliability of renewable power systems used in industrial applications.

C. Carbon capture, transport, utilization, and storage

CCUS will be a critical tool for many manufacturers. Affordable domestic natural gas has made the U.S. a global destination of choice for chemical manufacturers, driving billions of dollars in expansion and new plants since 2010. Natural gas and natural gas liquids are now the primary feedstocks, or raw materials, used in the U.S. to create thousands of chemical products. Natural gas also provides the power used to run complex chemical operations and is responsible for many of the emissions reductions gains made over the last 10 years. Today, natural gas is often the only adequate source of the heat energy available to chemical plants for cracking and other heat-intensive processes.

Bio-based and recycled feedstocks, new low or no-emissions energy sources, and electrification of chemical manufacturing processes hold promise, but these technologies are still in the development stage and broad commercial deployment at scale is still years if not decades away, making CCUS a necessary bridge technology, particularly for the chemicals and petrochemical sectors, which represent the largest source of capturable CO_2 from industrial processes. CCUS has the potential to help decarbonize the production of hydrogen, ammonia, and methanol as well as high-value chemicals like ethylene, propylene, and aromatics.

While CCUS holds considerable promise for some segments of the chemical industry, neither the technology nor the supporting infrastructure is in place to support at-scale deployment at this time outside a few specific plants and areas for demonstration purposes, and most carbon storage capacity and infrastructure remains tied to enhanced oil recovery (EOR) operations not available in many areas. Government support is needed to expand CO_2 utilization options and identify storage solutions for areas where EOR is not viable.

Recommendations:

1. Support research into lower-cost, lower-energy, and less water-intensive carbon capture technologies suitable to diverse manufacturing emissions streams.
2. Support feasibility studies and demonstration projects for retrofitting of existing plants.
3. Support integrated CCUS projects (from capture and CO_2 distribution infrastructure to utilization and/or storage) which can underpin regional hubs, capturing economy of network and scale.
4. Support fundamental research into less energy-intensive mechanisms for recovery of captured CO_2 from the scrubber medium and conversion of CO_2 to useful products at competitive costs.
5. Support research into innovative product chemistries used in advanced carbon reduction technologies.
6. Explore options for supporting a "carbon capture as a service" (CCaaS) ecosystem could also help with adoption and implementation.
7. Expedite implementation of its expanded authority under §§40301-40307 of the Infrastructure Act, including but not limited to the CO_2 Storage Commercialization Program, which authorizes grant funding to help

accelerate the development of large-scale carbon sequestration projects and associated infrastructure.

8. Policies and/or incentives for carbon capture should be broadly available so that, for example, smaller emitters that might wish to utilize carbon capture are not excluded from federal program eligibility.
9. Make carbon capture technologies for thermal oxidizers, which can be a source of CO_2 emissions in the chemical manufacturing industry, eligible for DOE support and/or other government programs and incentives.

D. Direct Air Capture

While direct air capture (DAC) technology is very promising, considerably more federal investment is needed to reduce costs and bring DAC to full-scale deployment. Products of chemistry will be critical to any future DAC deployment strategy. Many current DAC technologies use chemical sorbents to capture carbon from the ambient air. Membrane-based carbon capture technologies are another promising approach but are still largely at early technology readiness stages, requiring funding for further industrial-scale development. Polymers with high CO_2 selectivity will be essential to making this technology more efficient.

Recommendations

1. Expedite implementation of DOE's IIJA funding authority for projects contributing to the development of four regional DAC hubs, carbon transport, and carbon capture demonstration and pilot programs.[v]
2. Encourage development of multi-purpose hubs and infrastructure (CCUS, renewable) to leverage rights of way.

E. Lower-Emission Hydrogen

Chemical manufacturers are exploring and developing hydrogen as part of a strategy to reduce GHG emissions. Hydrogen is a clean fuel that can be used in fuel cells to generate electricity, or combusted for power, or heat. It can be produced from a variety of resources, such as natural gas, nuclear power, biomass, and renewable power like solar and wind.

Hydrogen holds particular promise for the chemical industry because the use of lower- or no-emissions sources of heat, such as hydrogen, could help transform steam cracking, an energy-intensive process used by chemical manufacturers. Steam cracking is used to create most of the materials used by the chemical industry and products used by other manufacturers. Transforming this process will be key for a lower-emissions chemical sector. Yet, despite hydrogen's clear promise, significant market and regulatory barriers remain to deployment and adoption of hydrogen technology. Support from DOE and its sister Departments in the Administration will be critical to accelerating commercialization of this important technology.

Recommendations:

1. Expedite DOE implementation of IIJA funding authorities, including the:
    a. Clean Hydrogen Research and Development Program
    b. Regional Clean Hydrogen Hubs Program

    c. Clean Hydrogen Manufacturing and Recycling Program
    d. Demonstration, Commercialization, and Deployment Program
2. Promote robust domestic supply chains for hydrogen-based technologies, including approval of enabling chemical and material technologies used to support hydrogen fuel cell manufacturing.
3. Accelerate investment, siting, and permitting of hydrogen and other clean energy infrastructure needed to support a lower emissions economy.
4. Encourage development of multi-purpose hubs and infrastructure (CCUS, renewable) to leverage rights of way.
5. Exempt facility retrofits and modifications to existing units from permit review requirements that impose more stringent federal and state emissions limits and discourage investments in new technologies.

Question C1.2: Factors driving abatement technology demonstration decisions.

Each company and facility will face a unique set of factors and considerations in making decisions about pilot and demonstration projects, but some of the common considerations and constraints companies face can include:

- The capital expense and operating costs associated with a project, and the types and level of funding and incentives available to offset such costs.
- Access to public or private capital and financing.
- Access to adequate and reliable critical lower-emissions infrastructure.
- Physical or geographic constraints (adequate space for new equipment, access to water, reliable power, or other resources).
- Operational and safety implications associated with introducing new, untested technologies into a complex industrial ecosystem.
- Regulatory barriers, including federal and state Class VI permitting for geologic sequestration, facility permitting, and land-use siting and permitting restrictions by FERC, EPA, the Army Corps of Engineers, and state authorities.
- Community acceptance of new and modified operations and equipment.
- Legal liability associated with transport, storage, and use of new fuels and feedstocks, and operation of novel equipment in a complex industrial ecosystem.
- Short and long-term liability associated with management of waste streams from new technologies (e.g., carbon transport and sequestration).

Question C1.4: Limiting factors/challenges in broad decarbonization technology deployment.

The challenges identified in response to C1.2 apply equally, if not more acutely, to broad commercial-scale deployment of emerging technologies, fuels, and feedstocks. One other significant challenge is the lack of a single, transparent, revenue-neutral, economy-wide federal carbon price signal on energy emissions paired with a leakage protection policy, to promote investment, rewards early action, and preclude the need for command-and-control performance standards and state mandates.

Question C:1.5: DOE resources most benefit the U.S. chemical industry.

ACC supports the full range of DOE resources identified in the RFI for an industry as diverse as the chemical sector. Our members vary in size, chemistries, financial resources, access to internal expertise, and decarbonization opportunities. ACC would welcome the opportunity to discuss these different DOE resources in greater detail in the future to explore how members can access them on a case-by-case basis.

Question C1.7: Energy efficiency and GHG reduction opportunities/challenges.

There is an opportunity for the chemical industry and DOE to work together to build on current technologies while developing new energy efficiency and GHG reduction tools using advanced chemistries and materials. ACC discussed these opportunities in detail in its response to DOE's RFIs on Deployment and Demonstration Opportunities for Carbon Reduction and Removal Technologies (DE-FOA-0002660) and Energy Sector Supply Chain Review, 86 Fed. Reg. 67695, attached as Exhibit A and B.

Question C7.1: Challenges unique to small and medium-sized manufacturers.

Beyond the general challenges and constraints discussed in questions C1.2 and C1.4, all of which can be magnified for smaller manufacturers, challenges include:

- **Disproportionate cost.** Some technologies that are well suited for large, high-volume manufacturing operations may be cost-ineffective or prohibitive for small and medium enterprises (SMEs) due to the limited ability to recover such costs through economies of scale. DOE's 2018 analysis of retrofit costs for carbon capture in the industrial sector provided an apt illustration.[vi] Looking at several types of chemical facilities, DOE estimated that installing and operating carbon capture at small facilities could be $55 to $100 higher per ton CO2 captured. In the case of hydrogen plants, the differential between small and large facilities was over $1500 per ton of CO2 captured.[vii] This illustrates the importance of developing multiple emissions abatement technologies and approaches.
- **Limited access to infrastructure.** Smaller manufacturers can face challenges in accessing low-carbon infrastructure due to their limited ability to pay for interconnections and the limited financial incentive for infrastructure providers to do so.
- **Lack of technical information:** SMEs have less access to technical information and expertise on innovations, best practices, and analytical tools needed to assess abatement strategies suitable for specific operational parameters.
- **Chemical supply chain issues:** SMEs can face challenges in getting data from suppliers and in gaining supplier participation in energy audit and management efforts.
- **Lack of access to low-carbon energy:** SMEs can face challenges competing for limited supplies of renewable power and fuels. They can also face challenges closing

the "last mile" of the distribution infrastructure needed to access low-carbon resources where suppliers and infrastructure developers do not see financial justification for the expenses necessary to invest in supporting infrastructure needed to support industrial-scale renewable use.

- **Challenges in creating partnerships:** SMEs can have greater challenges in developing or participating in research and investment consortia for new projects, funding applications, and hubs.

Question C7.2. What are the challenges unique to specific geographic regions?

- **Access to low-carbon infrastructure.** Virtually all of the emerging "pillar" abatement technologies will rely heavily on a vastly expanded network of clean energy and abatement infrastructure, including high-capacity renewable generation, transmission, and distribution, a distribution network to connect industrial users with suppliers of hydrogen, and pipeline infrastructure to connect carbon capture facilities with use markets or sequestration sites. A 2018 National Academies of Science Report map illustrated the challenges for CCUS by illustrating the disconnect in some areas between emissions sources and access to enhanced oil recovery CO2 demand or sequestration pore space.[viii]
- **Access to other natural materials.** For certain technologies, access to abundant water supplies, sunlight, wind, pore space, or other natural resources may be necessary for operation. In areas that lack these core resources, certain core technologies may not be cost-effective or even technically feasible.

Question C7.3. Challenges related to onsite carbon-free power generation?

- **Clean energy infrastructure.** As noted frequently, the transition to renewable, nuclear, and other low-carbon generation sources will require an unprecedented investment in generation, transmission/transport, and delivery infrastructure.
- **Infrastructure siting and permitting.** Building a clean energy and manufacturing infrastructure will not just require significant investments of money and capital, it will require policy makers, communities, and the private sector to rethink their approach to siting and permitting renewable infrastructure. Likely challenges will include historic NIMBY and environmental justice concerns as well as environmental reviews and permitting.
- **System reliability and continuity.** The significant power demands and 24/7 operational schedule of many industries will make system reliability a critical challenge. While these issues may be less acute in areas relying on nuclear generation, carbon-free generation sources like wind and solar generation will need to be paired with advanced batteries, fuel cells, and other high performance energy storage solutions before renewable energy can become a viable baseload solution.

Question C7.4. What are the challenges in retaining or reclaiming a domestic competitive advantage in EITE industries?

The U.S. chemical industry has been a leader in reducing the carbon intensity of its processes and many of its products are less carbon-intensive than foreign counterparts. Part of that leadership has come from its transition to natural gas over the last 15 years. Any national emissions reduction strategy should recognize the tremendous competitive advantage US industry has through its access to reliable domestic natural gas sources and the need to prevent trade and carbon leakage from less regulated, higher emissions imported products. Policymakers should also ensure that international carbon reduction and trade policies are based on sound data and consistent reliable methodologies, and that foreign importers are held to the same data collection and data quality standards required for domestic manufacturers.

Question C7.6: What are challenges and opportunities to support and grow market demand for low-carbon, U.S. made industrial products?

DOE can grow demand for low-carbon, U.S. made industrial products by 1) supporting and encouraging updated building codes that encourage the use of energy efficient building materials and products, and 2) by incentivizing research, development, integration, and deployment of innovative new chemistries and materials for use across the economy.

Question C7.7. How can DOE effectively support transformative industrial decarbonization?

ACC encourages DOE to adopt an all-of-the above strategy. This includes 1) research, funding, loan guarantees, and other financial incentives for development and deployment of new and improved industrial technologies, manufacturing practices, and enabling chemistries, materials and products; 2) rapid nationwide expansion of industrial clean energy infrastructure; 3) technical assistance, tools, and training resources; and 4) coordination with sister agencies to promote timely equitable reviews and approvals of industrial abatement projects, infrastructure, and enabling chemistries and materials.

Question C7.8: What are tradeoffs between advancing conventional efficiency improvements versus "best-in-class" zero emission industrial processes.

The chemical industry is already on its way to a lower-emissions, lower-carbon future, and its members are committed to continuing its progress in the years to come. A successful national strategy will recognize that this transition will only be successful if federal policies allow industries to remain productive and competitive throughout this journey. DOE should continue to promote conventional efficiency solutions to encourage continuous improvements across the chemical industry fleet while building the next generation of innovative technologies and solutions.

A successful strategy will also recognize the critical role that natural gas has played in reducing industrial emissions over the last 15 years and the role it will continue to play in the foreseeable future, as both a feedstock and reliable source of power and heat, to maintain the U.S. chemical industry's position as one of the most competitive and sustainable in the global market.

We look forward to working with the Advanced Manufacturing Office and its sister Offices to build on this public private dialogue to help the U.S. industry continue its role as a solution provider and market. Please feel free to reach out to me directly at (202) 297-4420 or charles_franklin@americanchemistry.com if you would like to discuss ACC's comments further.

Sincerely,

Charles Franklin, Senior Director
Energy, Climate, and Environment

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[i] ACC, The *Business of Chemistry By the Numbers*, *available at* https://www.americanchemistry.com/chemistry-in-america/data-industry-statistics/the-business-of-chemistry-by-the-numbers (last visited January 17 ,2022).

[ii] ACC is limiting its response to select questions to comply with the page limits in the RFI, but we hope to continue the dialogue on the full range of issues raised in the RFI in the future.

[iii] *See, e.g.,* Princeton University, *Net-Zero America: Potential Pathways, Infrastructure, and Impacts* (October 29, 2021), available at https://netzeroamerica.princeton.edu.

[iv] For more information on the role that chemical and materials innovation is playing in our low carbon future, please review ACC's Supply Chain RFI Comments (Exhibit B).

[v] *See* ILJA §40308.

[vi] DOE, *Industrial Source Carbon Capture Retrofit Database* (April 2, 2019), https://netl.doe.gov/node/9384.

[vii] *Id.*

[viii] *See, e.g.*, National Academies of Science (PNAS), *Low-capture-cost carbon dioxide emissions in the United States, existing carbon dioxide pipelines, and potential saline storage formations*, 115 (38) (Sept. 4, 2018), Table 1, at https://www.pnas.org/highwire/powerpoint/827828).

Exhibit A

American Chemistry Council

January 14, 2022

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 Energy Sector Supply Chain Review, 86 Fed. Reg. 67695

Dear Secretary Granholm:

Thank you for the opportunity to provide recommendations in response to your RFI on Department's Energy Sector Supply Chain Review. The American Chemistry Council (ACC) is pleased to participate in this important effort to build an energy sector industrial base that is diverse, resilient, and competitive while meeting economic, national security, and climate objectives.

ACC represents a diverse set of companies engaged in the business of chemistry, an innovative, $486 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. At the member level, the business of chemistry supplies the chemical products, polymers, and materials underpinning the energy sector's industrial base and the energy efficiency, clean energy, and clean energy-enabling technologies needed for a low-carbon economy.

The business of chemistry is crucial to the national economy. For example,

- 4.1 million jobs are created by the business of chemistry. For every one of these jobs created, 6.8 are generated elsewhere in the economy:
- 13% of chemicals are produced by the U.S., the world's second largest producer;
- 25%+ of the U.S GDP is supported by the business of chemistry;
- 9% of U.S. goods exports come from the business of chemistry, $125 billion in 2020, and this industry is among the largest exporters in the U.S.;

- 96%+ of all manufactured goods are directly touched by the business of chemistry;
- $27 billion in capital investments were made in the business of chemistry in 2020, including investments in structures and equipment;
- 41% of the total construction spending by the U.S. manufacturing sector in 2020 involved the business of chemistry;
- 946 million tons of products were transported in 2020, making the business of chemistry one of the country's largest shippers;
- $90K is the average annual pay in the business of chemistry which is 23% higher than the average manufacturing pay; and
- $10 billion plus were invested in research and development by chemical companies in 2020'

Many of the current and developing low-carbon energy solutions rely on innovations in chemistry – from energy storage, industrial carbon capture, and renewable energy generation 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 an energy and emissions-intensive sector, the chemical industry is also committed to continuous improvement in energy efficiency, emissions reduction, and sustainable operations. In short, the chemical industry is not only supplying many of the products and inputs needed for a low-carbon energy sector and economy; our members will also be important consumers and end markets for the energy and energy-enabling technologies DOE is reviewing in this RFI.

With that in mind, we are pleased to provide the following recommendations and responses to DOE's specific questions.

A. Crosscutting Topics

1. Defining the energy sector industrial base

The nation's energy sector industrial base is diverse, covering far more than just traditional energy extraction, petrochemical refining, and fuel and power production. Any definition of the energy sector industrial base must include:

a. Chemical and Plastic Inputs and Products.

The chemical industry is and will continue to be critical to a resilient energy base and low-carbon economy. Indeed, many of the innovative new technologies needed to support the Administration's carbon reduction goals rely on indispensable chemical and plastic inputs. Examples of the many products and chemistries critical to advanced energy technologies are listed in the technology-specific discussions below.

b. Clean Energy Distribution, Transmission, and Carbon Management Infrastructure

Clean energy and manufacturing technologies will only be successful if the infrastructure is available to store and deliver clean power, hydrogen, biomass, and other low-carbon fuels to residential, industrial, commercial, and institutional users. This includes, at a minimum, infrastructure needed for: power generation, transmission and distribution; the sourcing and manufacture of fossil fuels, renewable fuels, and energy-enabling products generated through chemical recycling.

c. Energy Efficiency Products and Technology.

A sound energy policy is not just about low-carbon electricity and fuels. DOE must recognize the importance of energy efficiency technology and energy-efficiency enabling products. In its March 2021 Report, *Net Zero by 2050: a Roadmap for the Global Energy Sector*, the International Energy Agency concluded that energy efficient solutions for buildings, vehicles, home appliances and industry would need to be scaled up rapidly, raising the average rate of energy efficiency improvements in the 2020s to about three times the average of the last two decades.[1] The chemicals and plastics industry supply or enable many of these solutions, from insulation and lightweight materials to plastic electrical insulation and components used in advanced automated building environmental control systems (*i.e.,* Smart Buildings).

High-performance building insulation and air barriers help save energy in our homes, offices, and factories. Building insulation can save up to 40 times the energy used to create it, while air barrier technology can reduce infiltration of outside air into homes by 10 to 50 percent, helping to reduce the energy necessary for home heating or cooling.

2. Crosscutting vulnerabilities and gaps in the supply chain and manufacturing base

As discussed in greater detail below, key vulnerabilities in the energy sector supply chain include:

- Regulatory uncertainty, including expanding regulation of critical chemistries used in the energy sector and federal barriers and community opposition to siting, permitting, and operation of energy-related suppliers, facilities, and infrastructure;
- Need for economically viable, commercial-scale energy generation, and industrial decarbonization technologies;

[1] https://www.iea.org/reports/net-zero-by-2050.

- Limited public funding to incentivize rapid private investments in low-carbon manufacturing technologies and infrastructure;

- Trade policies that can limit access to critical inputs;

- Uncertainty regarding the long-term supply and availability of, and public policy supporting, natural gas and other commodities critical to domestic power generation, fuel production, and chemical feedstocks used for low-carbon technologies; and

- Public policies which support the creation of economically sustainable uses for recycled plastics, including a modern regulatory framework that scales advanced recycling while continuing to grow mechanical recycling

3. Government Role

The federal government has a critical role in leading and partnering with industry to ensure a sustainable, robust, resilient, and competitive energy supply chain and energy industrial base. ACC and its members have developed a set of Policy Principles for U.S. Advanced Manufacturing (Policy Principles), identifying key policy needs and partnership opportunities to promote a strong supply chain and manufacturing sector.

These principles include:

- Free and Open Trade;
- Smart Regulation and Tax Policy;
- Digital Supply Chains;
- Modernized Infrastructure;
- The Importance of the Chemicals Value Chain to the Energy Industrial Base; and
- Tariff Relief ;

ACC's complete Policy Principles are attached as Exhibit A and are incorporated by reference into the response for each of the specific technology areas raised by the RFI. The remaining comments provide additional industry-specific information on the role that chemical inputs and materials play in enabling select technologies identified by DOE in the RFI.

B. AREA 2: SOLAR PV TECHNOLOGY

Solar PV Technologies are heavily reliant on inputs and materials from the chemical industry. For example,

- Silicones are used as conductive adhesives and encapsulants, providing durable bonds and seals, electrical insulation, and a reliable interconnection of solar cells – supporting high electrical conductivity and flexibility while contributing to lower material costs. Their resistance to ultraviolet radiation and strong transparency can improve panel efficiency, while their mechanical and chemical properties, such as flexibility and resistance to temperature and corrosion, can reduce repair needs and lengthen product life.

- Fluoropolymers increase the production efficiency of solar photovoltaic (PV) cells, are used in coatings to protect installations from harsh conditions and insulate wiring on many critical parts.

- Photovoltaic metallization pastes help make solar panels more energy efficient and can increase their power output by around 30 percent and extend their functional life.

Ensuring access to these and other chemical inputs and materials, using the principles identified in ACC's Policy Principles for U.S. Advanced Manufacturing, will be critical to maintaining and expanding the U.S. solar PV manufacturing industry and to rapid deployment of solar PV throughout the economy.

C. Area 3: Wind Energy Technology

Wind energy technologies are heavily reliant on inputs and materials from the chemical industry. For example:

- Silicones also used as bonding agents in the manufacture of wind turbines, helping to increase the durability and weather resistance of rotor blades and components. As lubricants, they facilitate the smooth performance of these rotor blades, helping to reduce wind turbine maintenance costs and maximizing energy efficiency. Silicones allow for larger wind turbines with greater energy potential.

- Fluoropolymers possess a unique combination of properties, and their excellent resistance to chemical, corrosion, temperature, and abrasion are key to increasing the service life and reliable operation of wind turbines in harsh environments. Fluoropolymers contribute to friction reduction and avoiding ice buildup. They are also used in release films critical to production of composite turbine blades, increasing the mold replacement life by up to 10 times.

- Plastics parts and components are extensively used in wind energy generation to reduce weight, lower costs, maximize productivity and enhance safety. For example, plastics are often used to make wind turbine blades because the material can reduce their weight which helps the blades spin faster, thereby increasing energy production.

- **Area 4: Energy Storage Technology**

High-Capacity Batteries (HCBs) are crucial to modern life as they are used in everything from vehicles to mobile phones to cameras to pacemakers. Both liquid state HCBs and solid state HCBs rely on novel product chemistries to maximize energy density, conductivity, power, safety, and performance.

The products of chemistry also help support other energy storage 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 are critical to the future of U.S. energy security have the potential to power innovation in areas like the auto industry, energy generation and storage, and military applications. 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.

To illustrate chemistry's role, the following table provides an example of chemistries, chemicals, and chemical-containing materials that contribute to the manufacture of a lithium-ion battery (*see* Table 1 below).

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

Components	**Materials**
Cathode (and binder)	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. PVDF is used as a binder for the primary (or active) materials.
Anode (and binder)	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. Binders, such as PVDF, can also be used as binders for the anode's active material.
Electrolyte	Lithium salts (including lithium hexafluorophosphate, lithium hexafluoroarsenate monohydrate, lithium perchlorate, lithium tetrafluoroborate, LiFSI (lithium bis(fluorosulfonyl)imide), LiTDI (Lithium 4,5-dicyano-2-trifluoromethylimidazole) 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, PVDF
Absorbent for electrolyte and electrode separator	PVDF copolymer film, PTFE, and other fluoropolymers, which are used as binders to bind lithium compounds and graphite to their respective electrodes and as an electrode separator.
Battery Pack Insulation	Polyphenylene sulfide film and polyetherimide film; silicones, sealants, adhesives
Packaging	Polycarbonate, polypropylene, polyamides, sealants, adhesives, thermoplastic composites, thermoplastics.

Components	Materials
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. 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.

1. *Global Demand for HCBs - and their Constituent Materials - is Growing*

The electrification of the transportation sector and integration of renewable energy sources into the electricity system is increasing global demand for batteries. 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. 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. 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.

2. *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.

3. *Battery Supply Chain Regulatory Challenges and Uncertainties*

As the Department of Energy reviews risks to the HCB supply chain, it will be important for it to explore with U.S. government agencies ongoing regulatory initiatives and actions relevant to the chemistries that support it. 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.

Smart regulation that reduces environmental risk while ensuring that critical next-generation chemistries have a viable pathway to commercialization should be the overarching goal. Absent regulatory certainty, the original equipment manufacturers

(OEMs) and battery pack manufacturers investing in manufacturing domestically may not have access to the critical chemistries they need to meet the demands of U.S. consumers while competitors manufacturing abroad will. This will distort the playing field and incentivize product sourcing for critical industry sectors outside the United States, directly contrary to the Administration's objectives of enhancing U.S. supply chain resiliency and strengthening environmental protection.

d. 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 homeowners 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 overly broad 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 an overly broad PFAS definition would have a catastrophic impact on the domestic EV battery business.

4. 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 Departments of Energy, Defense, and 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.

5. *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 support U.S. chemical manufacturers' ability 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 investments in building manufacturing capabilities takes years of planning and development, these incentives must be in place promptly to drive decisions for future production. Such incentives should 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;
- 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 would 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.

6. *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.

D. AREA 8: FUEL CELLS, ELECTROLYZERS, AND HYDROGEN

The expansion of fuel cell deployment is critical for achieving greater energy efficiency and lower emissions, with hydrogen cells emitting only water vapor.

While not specifically noted in the RFI, clean hydrogen has been identified as a promising area for research, development, and deployment in a variety of sectors.[2]

Products of chemistry will be important enablers of fuel cells and developing hydrogen technologies, and critical elements of the energy industrial supply chain. These include but are not limited to:

- the use of carbon fiber in hydrogen storage;
- recycling of fuel cell materials;
- the chemistries used in proton exchange membranes;
- specialty polymers for various fuel cell components;
- components for other fuel cell technologies such as Solid Oxide Fuel Cells; and

[2] *See, e.g.*, DOE. *First Energy Earthshot Aims to Slash Cost of Clean Hydrogen by 80% in One Decade* (https://www.energy.gov/eere/fuelcells/hydrogen-and-fuel-cell-technologies-office; DOE, EERE, *NETL To Join Collaboration On Clean Hydrogen Production* (Oct. 13, 2021) (https://netl.doe.gov/node/11494).

- thermoplastic and thermoset composites for hydrogen pressure vessels.

Fluoropolymers are a critical input to the fuel cell industry, even though they account for a very small percentage of a typical fuel cell's weight. Fluoropolymers help achieve high voltage and safety of electrolyte systems, required for next-generation batteries. They are utilized in cathode binders, battery gaskets and fuel cell membranes due to their ability to withstand high temperatures and chemically active conditions that challenge other materials, while also having excellent electrical conductivity.

E. AREA 9: SEMICONDUCTORS

U.S. chemical manufacturers have supplied important chemistries to the semiconductor industry since its inception. In 2019, the business of chemistry in the United States supported 379,000 workers in the semiconductor and electronic component industry, $44 billion in payroll, and $53.4 billion in value-added (see 2020 Guide to the Business of Chemistry, Table 1.2), available at https://www.americanchemistry.com/chemistry-in-america/data-industry-statistics/resources/2020-guide-to-the-business-of-chemistry. [3]

Electronic chemicals are essential in the manufacture of semiconductors, printed circuit boards, and other microelectronic devices. Among them are cleaners, developers, dopants, encapsulants, etchants, flame retardants, photoresists, specialty polymers, plating solutions, and strippers. In addition, chemical products can be used as key materials in various pipes, tubing, fittings, membranes, coatings, and moldings that are used in the semiconductor manufacturing process. This business serves major markets such as computers, telecommunications equipment, automotive, and medical devices. Long-term growth prospects are driven by the increasing proliferation of electronics in contemporary life. Key economic factors include increasingly global customers, high technological barriers to entry, device miniaturization, and shortening product life cycles.

A wide range of chemistries enable the manufacture of the silicon wafers, doping to impart innovative characteristics (e.g., conductivity), polishing and cleaning of the wafers, and further preparation of the wafers. These chemistries include:

- Semiconductor substrates derived from crystalline silica;
- Atmospheric gases (e.g., nitrogen, argon, oxygen, helium, and hydrogen);
- Specialty gases (e.g., nitrogen trifluoride (NF3), tungsten hexafluoride (WF6), germane (GeH4) and nitrous oxide (N2O));
- Fluoropolymers (see below);
- Photoresists and photoresist ancillaries;
- Chemical mechanical planarization (CMP) slurries and pads; and

[3] Available at: https://www.americanchemistry.com/chemistry-in-america/data-industry-statistics/resources/2020-guide-to-the-business-of-chemistry.

- Deposition, dielectric, and other electronic materials.

Minimizing contamination is a central discipline of semiconductor manufacturing. The needs for higher data transmission rates and improved signal integrity require smaller integrated circuits and contaminant- free manufacturing processes. Fluoropolymers are a key material for avoiding contaminants in semiconductor manufacturing because they exhibit a unique combination of properties, including resistance to chemical, thermal, and physical degradation that can withstand the semiconductor manufacturing process. Fluoropolymers are critical components of fab equipment (fittings, valves, wafer carriers), consumables (high purity air filters, lubricants), chemical and fire resistant coatings for exhaust ducting, and chemical and ultrapure water storage and transport equipment (tanks and pipes). They, and other products such as certain peroxides and fluorogases, can be used as etchants in the semiconductor manufacturing process. They are also used in powder coatings on duct work to protect against corrosion and heat.

In addition to their superior performance characteristics, fluoropolymers have well-established safety profiles and do not present a significant concern for human health or the environment. Because of their unique combination of physical and chemical properties, fluoropolymers meet criteria developed to identify polymers of low concern for potential risk to human health or the environment. These criteria were developed by chemical regulatory experts working collaboratively under the auspices of the Organization for Economic Cooperation and Development. Fluoropolymers are not water soluble and as a result are not found in sources of drinking water. Importantly, fluoropolymers are not PFOA or PFOS or other long-chain PFAS, nor can they transform to those substances in the environment.

1. Increased Semiconductor Manufacturing in the U.S. Would Provide New Supply Opportunities for U.S. Chemical Manufacturers

Many of the chemistries used in semiconductor manufacturing are specialty chemicals manufactured to specific grades and purities and in low volumes, often for multiple downstream sectors, including the semiconductor industry. Demand for semiconductors across the world is estimated to increase exponentially as businesses and consumers adopt new technologies that require greater processing power and connectivity to the Internet through 5G and other networks (e.g., autonomous vehicles, sensors, and connected and wearable devices). Demand for these chemistries will increase significantly. Specialty chemicals are an important part of the semiconductor supply chain and efforts by the U.S. Government to increase domestic semiconductor production should account for follow-on impacts to other industry sectors and the entire supply chain for each affected chemistry.

2. *U.S. Tariffs Limit the Supply of Important Inputs for the Manufacturing of Chemistries Relevant to Semiconductors*

A straightforward way to incentivize U.S. production of chemicals relevant to semiconductors is to provide relief from tariffs. ACC encourages the Departments of Energy, Defense, and Commerce to work with the Office of the U.S. Trade Representative (USTR) 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.

3. *Incentives May be Necessary to Ramp Up Production of Chemical Inputs for Semiconductor Manufacturing*

The U.S. government and state governments could help incentivize increased production using a number of tools:

- Tax credits and abatements;
- Expedited permitting for plant construction or upgrading;
- 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;
- 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.

4. *U.S. Regulation Also Impacts Chemicals Relevant to Semiconductors*

As the Department of Commerce reviews risks to the semiconductor supply chain, it will be important to explore with EPAthe impact of ongoing assessments on chemicals relevant to semiconductor manufacturing, performance, and safety, including with respect to the chemistries described below.

a. N-Methylpyrrolidone (NMP)

In the highly- controlled semiconductor manufacturing process, the semiconductor industry uses NMP in manufacturing for three main purposes:

- Dedicated solvent in certain photolithography formulations, including photoresists, Bottom Anti- Reflective Coatings (BARC) and polyimides;
- Solvent pre-wet of wafers prior to application of spin on polymer; and
- Component of photoresist stripper formulations.

In addition to the main uses of NMP, this chemical may also be used in similar photolithography applications such as mask making and related manufacturing processes that involve the attachment of the chip-to-chip packaging. Small quantities of NMP are used in analytical laboratories such as failure analysis labs for organic surface deconstruction to inspect device features. Lab use occurs in exhaust hoods with appropriate personal protective equipment such as gloves and eye protection. It is important to emphasize that there is no NMP left in the final product, which is a finished wafer that is then cut into individual semiconductor devices for assembly, test, and packaging. For further information about NMP, see the Semiconductor Industry Association's public comments as submitted to EPA on March 15, 2017.

In 2016, EPA undertook a risk evaluation on NMP, as required under the TSCA, which the Congress modernized in 2016. Upon conclusion of its risk evaluation, EPA found potential unreasonable risk for 26 out of 37 of its conditions of use, including domestic manufacture, import, and its use in semiconductor manufacturing. It is now considering possible risk management measures, which could restrict the availability of this chemistry so ensuring any potential management measures appropriately consider safety and uses for semiconductor manufacture will be important.

b. Octamethylcyclotetra-siloxane (D4)

Similarly, the EPA is conducting a risk evaluation on Octamethylcyclotetra-siloxane (D4), which is used as a dielectric material in semiconductor manufacturing.

The semiconductor industry uses D4 in totally enclosed radio frequency (RF) plasma enhanced chemical vapor deposition (PECVD) processes to deposit a very thin dielectric layer (measured in nm) on the wafer surface (an article). This specific CVD process is a radio frequency plasma-enhanced CVD (RF PECVD) process, which results in a high level of material conversion and rearrangement of OMCTS into a very thin layer of a distinctly different material than OMCTS, called SiCOH. The term “SiCOH” describes the elements present in the thin dielectric layer (it does not represent the stoichiometry). The SiCOH film structures (composed of Si, C, O and H atoms) are extensively cross-linked with little relation to the molecular composition of the D4 precursor. It can best be described as an inorganic porous glass like structure, it also may be characterized as an organosilicate glass. To be clear: the resulting SiCOH dielectric layer does not include any D4 impurities (also please note that the resulting transistors in the semiconductor chip would not be functional with D4 impurities included).

The D4 that is fed into the PECVD tool is destroyed within the tool plasma, and any potential remaining D4 in the process exhaust is believed to be destroyed via point of use abatement at the process tool. There are no known emissions of D4 to the environment. D4 is not present in the wafer or in subsequent process steps; thus, the industry is not a processor of D4 and D4 itself is not incorporated in semiconductor devices.

c. 4,4′-(1- Methylethylidene)bis[2, 6-dibromophenol] (TBBPA)

The use of TBBPA in the semiconductor industry occurs during a stage in the process known in the industry as “assembly, packaging and test” (APT). During the APT stage, a finished semiconductor wafer is divided into individual “chips,” encased in a plastic or ceramic “package,” and tested. This step in the process is where TBBPA is used as a flame retardant in semiconductor packages. This step in the process prepares an individual “chip” for incorporation into a circuit board used in a finished electronic device (e.g., mobile phone, computer, automobile, etc.) to meet fire safety requirements. Most electronic devices now contain printed circuit boards providing intelligent and interactive functions. Due to the nature of their composition (flammable components) and function (transmission of electrical charges), printed circuit boards require ignition protection to help meet product safety and performance requirements. TBBPA is essential to help meet fire safety standards and certification requirements for printed circuit boards.

TBBPA is one of the base-chemical components used to react with an epoxy and becomes part of a polymer that encases the chip to form the semiconductor package. The TBBPA is not available for extraction from the polymer because the TBBPA becomes a part of the polymer. Semiconductor manufacturers may also make modules that contain multiple chips on a circuit board. TBBPA may be a part of the resin system in the circuit board. Other articles imported by the semiconductor industry that may contain TBBPA include cables and transceivers.

TBBPA has a strong safety profile. Numerous government assessments world-wide also conclude TBBPA does not present a risk to human health or the environment. TBBPA is currently undergoing a risk evaluation by EPA under the TSCA.

d. Fluorinated Chemistries

Certain other developing or potential materials and products regulations need to be carefully reviewed and drafted so that regulatory definitions are clear and focused and not overly broad (for example, in the case of potential PFAS-related regulations) such that key fluorinated chemistries that are essential to the semiconductor industry are not inadvertently restricted. For example, fluoropolymer-based components are critical to the semiconductor manufacturing process because they can stand up to the aggressive etching chemicals and help provide the necessary purity required in the production of microchips and other electronics, where even trace contaminants can severely affect production yield. To this end, we support coordination among all key agencies so that appropriate, science-based regulations can be developed to account for all policy objectives, including ensuring strong domestic supply chains for key industries such as the semiconductor industry.

e. Hydrofluorocarbons

The EPA is also beginning the regulatory process to implement the American Innovation in Manufacturing (AIM) Act that was included in the Consolidated Appropriations Act, 2021. The AIM Act sets out requirements for the phasedown of hydrofluorocarbons (HFCs), including establishing production and consumption allocation levels for HFCs used in the semiconductor manufacturing process. This process should also be appropriately coordinated with EPA to equitably distribute HFC allocations among key producers and consumers.

f. Phenol Isopropylated Phosphate (3:1) (PIP (3:1))

EPA has noted that PIP (3:1) has been identified as being used in machinery used to produce semiconductors, such that the production of semiconductors could be adversely affected if machinery cannot be serviced. Although an EPA regulation targeted PIP (3:1) and articles containing it for restriction, EPA has reopened the comment period, and on March 8 issued a No Action Assurance Regarding Prohibition of Processing and Distribution of Phenol Isopropylated Phosphate (3:1), PIP (3:1) for Use in Articles, and PIP (3:1)-containing Articles under 40 CFR 751.407(a)(1).

During this period, it is important that key agencies coordinate with EPA so appropriate regulatory action can fully consider supply chain needs and policy objectives.

F. AREA 12: CARBON CAPTURE, CONVERSION, TRANSPORT, AND STORAGE MATERIALS

Current and future carbon capture technologies will require a wide variety of chemicals, plastics, and membrane technologies to meet the significant role carbon capture must play in decarbonizing our industrial sector. Future research and development must recognize the role that these inputs play in the build out of this technology.

G. AREA 13: CYBERSECURITY AND DIGITAL COMPONENTS

The need for resilient, diverse, and secure supply chains is crucial to ensuring U.S. economic prosperity and national security. Such supply chains are needed to address conditions that can reduce critical manufacturing capacity and the availability and integrity of critical goods, products, and services. Currently, the chemical distribution supply chain is largely a paper-based system, requiring shippers, carriers, and customers to sign-off using paper shipping documents. This cumbersome process needlessly creates inefficiencies and increased safety risks.

Converting from a paper process to a digital platform for maintaining and processing shipping documents throughout the chemical distribution supply chain would transform the way chemical products are handled and managed, offering improved distribution and routing efficiency, decreased dwell time, inventory tracking and management, advanced analytics, and contactless processes to enhance the health and safety of workers. Such a conversion will reduce paperwork, consistent with the 1980 Paperwork Reduction Act. In FY2017 alone, DOT imposed 189.24 million hours of paperwork burden on the U.S. public. A standardized approach for the physical data carrier (e.g., barcode/RFID) that links the physical shipments with the digital backend needs industry support and government incentives to move forward.

The U.S. Department of Energy should support modernization of the energy, chemical transportation supply chain by working with the Department of Transportation on federal investment in digitization of transportation infrastructure. The federal government can do this by:

- Promoting adoption of a standardized approach to electronic shipping documents and supply chain information to support the efficient and safe transportation of chemicals throughout the U.S.

- Investing in and providing incentives to modernize digital infrastructure across the nation to improve connectivity, and data security.

- Providing incentives to members of the chemical transportation supply chain to adopt electronic shipping documents and related technology.

- Removing regulatory barriers to adopting digital solutions for improving the flow of chemicals throughout the supply chain.

- Investing in R&D and provide grant funding for the development of creative technology solutions for enhancing the efficient and safe transportation of chemicals through the supply chain.

The global COVID-19 pandemic has posed new and unforeseen challenges to supply chains around the world, prompting carriers, shippers, and retailers to adjust processes and implement new worker health and safety protocols while keeping the flow of goods and services moving. This evaluation of processes and how to conduct business has also prompted renewed consideration of how to accelerate technology deployments, collaborate with trading partners, and think outside-the-box to enhance efficiency and on-shelf-availability during a period of unprecedented demand for consumer products.

Benefits of a digital supply chain include:

- Improved operational/workflow efficiency by streamlining operations and minimizing dwell time during the pickup and delivery process of chemicals during their distribution throughout the supply chain.

- Enhanced health, safety, and security of chemical distribution by offering a contactless workflow process and enabling a digital communications platform for exchanging chemical safety information among shippers, carriers and first responders during an incident.

- Use of digital shipping documents would have a profound effect on hazardous materials incident communications and response information support. Instant access to chemical safety and emergency response information, including the ability for push communications to fire fighters and first responders prior to their arrival on the scene would be revolutionary. During an incident, every second counts. Geospatial tracking used to pinpoint the location of a spill, or a release, could save valuable minutes during a response event by identifying the closest response asset and notifying first responders in advance on details such as type and quantity of chemicals, type of PPE required, potential evacuation measures, response options and public notification needs. Storage and access to historic data for incident response analysis, could be used to help design better systems and reduce the likelihood of future incidents.

- Promoting greater global adoption of standardized approaches to digital shipping documents will further facilitate access for US-manufactured products to key global markets, sustaining U.S. jobs and innovation.

H. AREA 14: COMMERCIALIZATION AND COMPETITIVENESS

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;
- 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 and other contributors to the domestic energy industrial base and supply chain 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, we urge the Administration to enforce U.S. trade agreements and U.S. trade remedies laws.

I. Efficient Materials and Inputs

Though not identified as a distinct technology, energy-efficient, materials, products, and product enablers make an important contribution to a comprehensive industrial energy base.

Plastics play a particularly important role in promoting energy efficient economy. For example. Plastic chemistries and materials:

- **Help Drive Down Greenhouse Gas Emissions** – Numerous Life Cycle Analyses find that use of plastics in consumer products and packaging can significantly *reduce* greenhouse gas emissions compared to many alternatives, primarily because strong yet lightweight plastics require much less material to perform similar functions. This means that plastics are playing a key role in lowering our carbon footprint and are helping combat climate change.

- **Increase Vehicle Fuel Efficiency** – Carmakers use durable, lightweight plastics to decrease the weight of car parts, which reduces fuel use and greenhouse gas emissions. In fact, most of today's cars are made of about 50% plastics by *volume* but only 10% by *weight*. Light-weighting also is critical to increasing the range of low-carbon electric vehicles.

- **Increase Home/Buildings Energy Efficiency** – To drive down energy use and greenhouse gas emissions, energy-saving plastic building materials improve insulation performance (R-value) and limit unwanted airflow. Plastic building products – foam insulation, house wrap, window frames, and caulks/sealants – play crucial roles in sealing a building envelope against heating and air conditioning losses, which saves energy and reduces greenhouse gas emissions.

J. Sustainable Material Sourcing

In thinking about a sustainable energy industrial base and supply chain, one other important priority should be promoting the efficient use of domestic resources and materials. Federal policy should build the capacity and demand for advanced recycling technologies that can provide source material for the types of materials, plastics, and chemical enablers discussed through these comments.

Advanced recycling technologies (also called chemical recycling) take plastics back to their molecular building blocks to create new virgin-quality raw materials. These technologies complement traditional (mechanical) recycling methods and are essential to helping consumer goods companies meet their goals for using more recycled plastics. Advanced recycling also is essential to helping keep plastic waste out of the environment and achieving a circular economy. The United States should support the growth of advanced recycling by enabling policies that foster a more circular economy for plastics. This would entail changes to existing regulations as well as expanding technological capabilities.

K. Summary

In closing, let me once again thank you for your public engagement on this important issue. Our members are committed to safe, sustainable sourcing and manufacturing, and are proud of the low-carbon solutions we provide and or role as critical suppliers and markets in our energy industrial base supply chain. We hope that this RFI will be the start of broader and more in depth discussion with ACC, its members, and other stakeholders, on how federal policymakers work with industry to build an energy sector industrial base that is diverse, resilient, and competitive while meeting economic, national security, and climate objectives.

If you have any questions or would like more information, please free to contact ACC via phone at (202) 297-4420 or email Charles_Franklin@americanchemistry.com.

Sincerely,

Charles Franklin, Senior Director
Energy, Climate, and Environment
American Chemistry Council

Appendix A: Policy Principles for U.S. Advanced Manufacturing

Among the many subsectors of U.S. manufacturing, the chemical sector stands out as a bright spot: With $486 billion in shipments, U.S. chemical makers produce 13% of the world's chemicals, are responsible for 9% of all U.S. goods exports ($128 billion) and maintain a positive trade balance (+$35 billion). In doing so, the business of chemistry drives innovation through investments in R&D that exceed $10 billion annually, provides 529,000 skilled, good-paying jobs—plus over 4.1 million related jobs—that support families and communities, and enhances safety through a diverse set of products.

As the Biden Administration seeks to bolster domestic supply chains and ensure American leadership in advanced manufacturing, we offer the following principles to serve as a compass for federal action and guide revisions to the *Strategy for American Leadership in Advanced Manufacturing*:

1. Free and open trade benefits the domestic industrial base.
2. Smart regulation bolsters critical supply chains.
3. Digital supply chains facilitate resilience.
4. Modernizing infrastructure attracts domestic investment.
5. The chemicals value chain is essential to the domestic industrial base.
6. Tariff relief bolsters the domestic industrial base.

1. <u>Free and Open Trade</u>

Over the past four years, the chemical industry has witnessed firsthand how trade policy uncertainty and the levying of high and broad tariffs on imports and exports has disrupted the 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, add costs to the chemical and downstream industries, 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 America's greatest and most competitive exports, including chemicals.

We encourage the federal government to focus on what makes the U.S. chemical industry competitive:

- Abundant sources of natural gas and natural gas liquids, the primary feedstocks and energy sources for manufacturing chemicals in the United States;
- A 21st century digital infrastructure for the safe, secure, sustainable, competitive, reliable, and efficient transportation of 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 this increase in demand will be even more rapid 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 lead to 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, we urge the Administration to enforce U.S. trade agreements and U.S. trade remedies laws. Furthermore, we encourage the Administration to seek U.S.-equivalent standards for environmental protection globally, and to ensure that EPA's processes for implementation of new standards are science-based and transparent, so that chemical products, processes, and jobs do not move out of the United States into jurisdictions with weaker environmental protections.

2. Smart Regulation

The resilience of critical supply chains must be supported by a domestic chemical management regulatory structure that, in addition to pursuing chemical safety, also enables innovation and the development of high-performance products. It is important to consider the impact of EPA assessments of new and existing chemistries that are vital to U.S. national security interests and climate priorities (e.g., chemicals that are essential to manufacturing, performance and safety of semiconductors, high-capacity batteries, renewable energy installations, 5G infrastructure, medical devices, building insulation, and other critical products).

Interagency review is needed to ensure that policies to ensure chemical safety do not inadvertently impede critical supply chains. "Upstream" manufacturing is necessary to enable "downstream" development of products essential to the Administration's goals.

To this end, the ACC urges alignment of regulatory and supply chain initiatives to avoid unintended, adverse consequences. ACC member companies make many essential inputs for products that support the domestic industrial base, such as high-capacity batteries, lightweight materials for autos and trucks, and semiconductors. Chemical regulation that does not fully consider essential uses, the need to promote innovation, and the performance or non-performance of alternatives, as well as other benefit-cost analysis criteria, may result in the offshoring of domestic supply chains.

For example, as EPA examines per- and polyfluoroalkyl substances (PFAS) and implements its PFAS Strategic Roadmap, interagency review is critical. Fluoropolymers have a strong environmental health and safety profile and have been demonstrated to meet internationally utilized criteria for "polymers of low concern." Fluoropolymers offer a pathway to commercializing next-generation chemistries to advance many of the critical supply chains identified in the White House Executive Order on America's Supply Chains[4] and 100-day review report[5].

Fluoropolymers help to advance sustainability and manufacturing goals (e.g., reducing emissions and increasing domestic production of semiconductors). EPA should reject calls for a broad definition of PFAS that would be decoupled with specific chemical properties and risk profiles, and that could undermine other environmental and sustainability objectives of the Administration. For instance, lithium ion (Li-ion) batteries for electric vehicles cannot be made without fluoropolymers, and those fluoropolymers in Li-ion batteries pose minimal risk to the environment. We propose that EPA focus on non-polymeric perfluoroalkyl and polyfluoroalkyl substances that contain at least two fully fluorinated carbon atoms and should exclude gases and volatile liquids. This definition would capture PFAS of broad concern, such as perfluorooctanoic acid (PFOA) and perfluorochemicals (PFOS).

ACC members take their environmental stewardship responsibilities seriously, and they invest heavily to ensure that fluoropolymers are produced in an environmentally responsible manner. Additionally, with the Administration poised to implement a once-in-a-generation level of investment in the nation's infrastructure and climate priorities, there is a tremendous opportunity to create financial and other incentives for industry to invest in polymer circularity that would create a closed-loop system in the United States for chemistries that are pivotal to the long-term viability of strategic U.S. supply chains and the industrial base of a world-leading economy.

Advancing smart regulation that reduces environmental risk and drives environmental and sustainability benefits -- while ensuring that critical next-generation chemistries

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[4] https://www.whitehouse.gov/briefing-room/presidential-actions/2021/02/24/executive-order-on-americas-supply-chains/

[5] https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf?utm_source=sfmc%E2%80%8B&utm_medium=email%E2%80%8B&utm_campaign=20210610_Global_Manufacturing_Economic_Update_June_Members

have a viable path to commercialization -- should be an overarching goal. Absent regulatory certainty for fluoropolymers, downstream manufacturers may not have access to the chemistries needed to meet the demands of U.S. consumers. Manufacturers in other nations will exploit this void.

A coordinated approach provides the best opportunity to ensure that (i) domestic "downstream" manufacturers have access to chemistries necessary for innovation; and (ii) domestic "upstream" chemical manufacturers make the significant and necessary R&D and capital investments.

3. Digital Supply Chains

The need for resilient, diverse, and secure supply chains is crucial to ensuring U.S. economic prosperity and national security. Such supply chains are needed to address conditions that can reduce critical manufacturing capacity and the availability and integrity of critical goods, products, and services. Currently, the chemical distribution supply chain is largely a paper-based system, requiring shippers, carriers and customers to sign-off using paper shipping documents. This cumbersome process needlessly creates inefficiencies and increased safety risks.

Converting from a paper process to a digital platform for maintaining and processing shipping documents throughout the chemical distribution supply chain would transform the way chemical products are handled and managed, offering improved distribution and routing efficiency, decreased dwell time, inventory tracking and management, advanced analytics, and contactless processes to enhance the health and safety of workers. Such a conversion will reduce paperwork, consistent with the 1980 Paperwork Reduction Act. In FY2017 alone, DOT imposed 189.24 million hours of paperwork burden on the U.S. public. A standardized approach for the physical data carrier (e.g., barcode/RFID) that links the physical shipments with the digital backend needs industry support and government incentives to move forward.

The U.S. Department of Energy should support modernization of the energy, chemical transportation supply chain by working with the Department of Transportation on federal investment in digitization of transportation infrastructure. The federal government can do this by:

- Promoting adoption of a standardized approach to electronic shipping documents and supply chain information to support the efficient and safe transportation of chemicals throughout the U.S.

- Investing in and providing incentives to modernize digital infrastructure across the nation to improve connectivity, and data security.

- Providing incentives to members of the chemical transportation supply chain to adopt electronic shipping documents and related technology.

- Removing regulatory barriers to adopting digital solutions for improving the flow of chemicals throughout the supply chain.

- Investing in R&D and provide grant funding for the development of creative technology solutions for enhancing the efficient and safe transportation of chemicals through the supply chain.

The global COVID-19 pandemic has posed new and unforeseen challenges to supply chains around the world, prompting carriers, shippers, and retailers to adjust processes and implement new protocols to ensure the health and safety of workers while keeping the flow of goods and services moving. This evaluation of processes and how to conduct business has also prompted renewed consideration of how to accelerate technology deployments, collaborate with trading partners, and think outside-the-box to enhance efficiency and ensure on-shelf-availability during a period of unprecedented demand for consumer products.

<u>Benefits of a digital supply chain include:</u>

- Improved operational/workflow efficiency by streamlining operations and minimizing dwell time during the pickup and delivery process of chemicals during their distribution throughout the supply chain.

- Enhanced health, safety, and security of chemical distribution by offering a contactless workflow process and enabling a digital communications platform for exchanging chemical safety information among shippers, carriers and first responders during an incident.

- Use of digital shipping documents would have a profound effect on hazardous materials incident communications and response information support. Instant access to chemical safety and emergency response information, including the ability for push communications to fire fighters and first responders prior to their arrival on the scene would be revolutionary. During an incident, every second counts. Geospatial tracking used to pinpoint the location of a spill, or a release, could save valuable minutes during a response event by identifying the closest response asset and notifying first responders in advance on details such as type and quantity of chemicals, type of PPE required, potential evacuation measures, response options and public notification needs. Storage and access to historic data for incident response analysis, could be used to help design better systems and reduce the likelihood of future incidents.

- Promoting greater global adoption of standardized approaches to digital shipping documents will further facilitate access for US-manufactured products to key global markets, sustaining U.S. jobs and innovation.

4. Modernized Infrastructure

The U.S. business of chemistry will be central to rebuilding and modernizing our nation's aging infrastructure. An efficient transportation network and robust energy infrastructure, including building out infrastructure for electric vehicles, are vital to chemical manufacturing and the industry's ability to innovate and create good-paying American jobs.

A comprehensive infrastructure package should also provide funding to upgrade our ports and shipping channels, adopt reforms to promote competitive and reliable freight rail service, and bring trucking regulations into the 21st century so that the industry can deliver the essential products Americans depend on every day as safely and efficiently as possible. Further, the industry needs a modern, resilient energy grid that communities can count on and that enables always-on power for chemical manufacturers. To support new construction projects for rebuilding U.S. infrastructure, the Administration and Congress also need to work together to modernize the process for environmental reviews and permitting decisions.

The Administration's supply chain strategy should also ensure that the criteria for funding infrastructure projects are aligned with critical supply chain priorities, including increasing domestic production, facilitating exports, and ensuring access to critical minerals and other strategic materials. Infrastructure funds should prioritize addressing intermodal freight bottlenecks that are critical to the import and export of goods, specifically seaports (e.g., allowing for processing of larger container ships), related infrastructure, and distribution centers. And the federal government should provide incentives (e.g., funding for job training and vocational programs) to address supply chain-related worker shortages and turnover (especially in the trucking industry). This would encourage more workers to enter the port workforce, including workers in the longshore, warehouse, and trucking sectors, and help the current port workforce upskill as technology is increasingly deployed throughout the supply chain.

Just as a highly functioning infrastructure system is important to keeping chemical manufacturing strong in America, the chemical industry is key to making America's infrastructure better. ACC member companies create advanced materials and technologies that go into infrastructure upgrades to make them more sustainable and resilient in addition to helping make them lighter, stronger, and more cost effective. ACC also urges the White House and Congress to enable much-needed recycling infrastructure systems, including advanced recycling, and enable the use of recycled materials in infrastructure applications such as asphalt.

Our supply chain-related infrastructure also needs to be secured from both physical and cyber threats. Presidential Policy Directive 21 identified the chemical sector as one of sixteen "critical infrastructure sectors." While facility security has long been a focus of the chemical industry, the events of September 11th led to heightened security concerns. Within months of the terrorist attacks of 9/11, ACC created a stringent, mandatory security program called the Responsible Care® Security Code. Since then, ACC members have invested billions to further enhance site and transportation security at their facilities.

ACC member companies, as well as all actors in their supply chains, must also assess cybersecurity vulnerabilities, implement security measures to address them, and provide appropriate training and guidance to employees on current and emerging threats. Business leaders are increasingly investing in the security of their companies' people and information, as well as their plants, equipment, technology, storage facilities, and buildings. Companies must also consider the security of other assets, such as tank cars and other vehicles, utilities (electric power, steam, natural gas, water, sewer, etc.), railroad lines and roads, cogeneration facilities, hazardous waste processing facilities, supplies, tools, office equipment, and even employees' personal property.

Based on ACC survey data, some ACC members spend as much as 2% of their sales on security for their business operations. Security spending includes bodyguards, guard dogs, patrol and other guard services, other security services, electronic surveillance, remote electronic monitoring of security, and miscellaneous protective services. Security costs also include those traditionally associated with information, computer, network, and related IT security. Other costs not contained in this figure include security efforts by non-security personnel (e.g., building services); costs of process safety measures; higher freight expenses; inventory control; additional procedures; insurance; and other related expenses. Thus, these costs do not represent the entire cost of security but rather one fraction of it; actual total spending for security could be several times this amount.

Congress should provide funding to companies that operate in critical infrastructure sectors, including chemical companies, to offset these costs, which are necessary for U.S. national security and also diminish funds that could otherwise be spent on R&D, new hiring, and capital improvements. Congress should also pass legislation that fosters the sharing of timely cyber threat information by providing protections related to lawsuits, public disclosure, and antitrust concerns, while also guarding privacy and civil liberties. In addition, the Administration should aggressively prosecute cybercrimes and hold accountable those who perpetrate acts intended to cause harm to critical infrastructure operating systems, steal intellectual property and trade secrets, or obtain personal information for financial gain.

In addition, the Secretary of Commerce should seek recommendations from the Department's Advisory Committee on Supply Chain Competitiveness and from stakeholders through public comment on long-term strategies for mitigating port congestion and preventing container shortages that negatively impact the ability of U.S. companies to export. We encourage the Department of Transportation to work closely with Commerce in this important initiative.

Areas for exploration include: the feasibility of creating capacity to manufacture some critical mass of containers and chassis in the United States; providing federal and state tax incentives to influence the calculus of container lines in terms of ensuring sufficient container availability to support exports; implementing additional security measures to ensure delayed exported and imported containers are secure; and providing federal incentives for port communities, container lines, shippers, and other supply chain actors to adopt IoT systems and interoperable digital platforms in order to enhance supply chain visibility and enable better planning and use of predictive analytics.

On the latter point, the White House should convene a meeting with key U.S. supply chain actors and the U.S. standards community to explore whether there is an opportunity to develop voluntary consensus standards to promote the interoperability of disparate digital supply chain connectivity and visibility tools across the supply chain to serve the national interest, as well as support the development of international standards for digital documentation to ensure global harmonization.

Finally, ACC welcomes the Administration's recent Executive Order on Promoting Competition in the American Economy, in particular the provisions encouraging the Surface Transportation Board and Federal Maritime Commission to strengthen competition in the freight rail and maritime industries; greater choice would help reduce costs and improve service for U.S. producers.

5. The Importance of the Chemicals Value Chain

We encourage the Administration to support every stage of the chemical supply chain. To ensure that U.S. chemical manufacturers are in a stronger position to meet the increased demand for products containing chemicals 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, processing, and recycling chemicals in North America. A strong North American supply chain for chemicals will therefore strengthen the U.S. transportation 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 investment in new clean technologies and information technology products in the United States is clear, the business case for where to produce chemistries and materials essential to these technologies and products 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, update existing facilities, 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;
- Potential cost-shared grants to support domestic capital investments for key upstream materials, including chemical inputs, as well as infrastructure;
- Low-interest loans that support critical mineral mine development;
- Funding to support new downstream industry development due to the new on-shore supply of critical minerals (like rare earths);
- Relief/insurance for domestic supply chain disruptions, e.g., hurricanes, wildfires, and winter storms;
- Infrastructure investment to support increased production; a safe secure, sustainable, innovate, digitized, competitive, reliable and efficient supply chain; and greater access to materials and exports; and
- Value chain based approach to market development.

Supply security may also be supported by cooperation under the U.S.-Mexico-Canada Agreement (USMCA), with other U.S. FTA partners, or additional trusted partners around the world. Chemicals supplied by these partners would be expected to flow more freely without restrictions and security risks.

6. Tariff Relief

A straightforward way to incentivize U.S. production of chemicals that can support the industrial base is to provide relief from tariffs on raw materials and intermediate inputs necessary for manufacturing chemicals. ACC encourages the Department of Commerce and the Office of the U.S. Trade Representative to identify the relevant chemicals exposed to most-favored-nation customs duties – particularly from trusted partners – 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 raw materials and intermediate inputs. Furthermore, if they are also subject to additional tariffs under Section 301, USTR may be able 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 for their products, instead of paying tariffs on intermediate inputs.

February 1, 2022

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

From: Charles Franklin
Senior Director, Energy, Climate and Environment
American Chemistry Council
202-297-4420
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Re: Request for Information on Deployment and Demonstration Opportunities for Carbon Reduction and Removal Technologies (DE-FOA-0002660)

Submitted via: DeployDemoOppsRFI@netl.doe.gov

Dear Hon. Granholm:

On behalf of the American Chemistry Council (ACC) and its members, I am pleased to submit the following response to the December 6, 2021, Request for Information (RFI) on Deployment and Demonstration Opportunities for Carbon Reduction and Removal Technologies.[1]

ACC represents a diverse set of companies engaged in the business of chemistry, an innovative, $486 billion enterprise.[2] ACC members work to solve some of the biggest challenges facing our nation and our world, driving innovation through investments in R&D that exceed $10 billion annually. ACC members provide 529,000 skilled, good-paying jobs—plus over 4.1 million related jobs—that support families and communities

[1] *See DOE, DOE Seeks Information on Deployment-Ready Carbon Reduction and Removal Technologies* (Dec. 18, 2022), *available at* https://www.energy.gov/articles/doe-seeks-information-deployment-ready-carbon-reduction-and-removal-technologies?utm_medium=email&utm_source=govdelivery.
[2] ACC's mission is to deliver value to our members through evidence-based 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.

and enhance safety through a diverse set of products. Our members and the business of chemistry are crucial to the national economy. For example:

- For every job created by the business of chemistry, 6.8 are generated elsewhere in the economy.
- 13% of chemicals are produced by the U.S., the world's second largest producer.
- 25%+ of the U.S GDP is supported by the business of chemistry.
- 9% of U.S. goods exports come from the business of chemistry, $125 billion in 2020, and this industry is among the largest exporters in the U.S.
- 96%+ of all manufactured goods are directly touched by the business of chemistry.
- $27 billion in capital investments were made in the business of chemistry in 2020, including investments in structures and equipment.
- 41% of the total construction spending by the U.S. manufacturing sector in 2020 involved the business of chemistry.
- 946 million tons of products were transported in 2020, making the business of chemistry one of the country's largest shippers.
- $90K is the average annual pay in the business of chemistry which is 23% higher than the average manufacturing pay.
- Billion plus were invested in research and development by chemical companies in 2020.[3]

The US Chemicals Industry has a particularly critical role in driving down our nation's carbon emissions by supplying chemical products and inputs needed to advance our nation's sustainability and carbon reduction goals. Chemical-based products and technologies support the fight against climate impacts in a range of applications, including carbon capture and use, renewable energy sources like solar and wind, battery storage, electric and high-efficiency vehicles, and building materials that reduce energy consumption. With respect to fossil energy abatement, for example:

- Many traditional carbon capture technologies rely on amine scrubbing chemistries and other product chemistries to capture and purify industrial CO_2 streams.

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[3] *See* American Chemistry Council, The *Business of Chemistry By the Numbers*, available at https://www.americanchemistry.com/chemistry-in-america/data-industry-statistics/the-business-of-chemistry-by-the-numbers (last visited January 17 ,2022).

- New product chemistries and technologies have the potential to increase the efficiency and reduce the cost of carbon capture, distribution, and storage.

- The chemical sector constitutes one of the most promising future markets for captured CO2, and almost all future uses will require the use of new or innovative chemistries.

As outlined in greater detail in ACC's January 15, 2022, response to DOE's Request for Information on Energy Sector Supply Chain Review, the business of chemistry is integral to most if not all the current and future decarbonization solutions needed to reach the Administration's economy-wide carbon emission reduction goals.[4]

Our members also are taking action to reduce the industrial greenhouse gas intensity of their own supply chains, operations, and products. From 2017 to 2020, ACC's reporting members have reduced their GHG intensity by approximately 10 percent. Many ACC members have set emission reduction targets and goals and are implementing strategies to make meaningful reductions. We are committed to sharing our industry's progress. Through Responsible Care®, ACC members publicly report their GHG intensity and energy use and have reduced their GHG emissions intensity.

Achieving these ambitious goals will not be easy. Long-recognized as a "hard-to-abate" industrial sector, the "chemical industry" produces thousands of unique product chemistries, each with different feedstocks, energy inputs, sites, manufacturing technology requirements, and emissions profiles. Chemical manufacturers, in turn, face unique technical, regulatory, financial, market, performance and supply chain constraints in modifying products and operations.

Recognizing these challenges, ACC is working with its members to identify carbon reduction strategies, infrastructure needs, and critical research and policy elements needed to support industry-wide action on climate change. A comprehensive carbon mitigation strategy must consider product emissions and sinks from across the lifecycle, including upstream fuel and feedstock emissions, manufacturing process emissions, energy emissions from fuel and steam, energy emissions from electricity, avoided carbon during the use phase, and end-of-life or recycling phases. Each of these carbon reduction levers raises novel technology and logistical challenges.

Multiple new technologies & game-changing breakthroughs will be needed for lower emissions manufacturing. Federal policymakers will be essential partners in this effort to ensure that government policies and market forces promote a sustainable and robust manufacturing sector rather than simply offshoring critical manufacturing capacity to other markets. Key support areas include:

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[4] *See* American Chemistry Council, *Response to Notice of Request for Information (RFI) on Energy Sector Supply Chain Review*, submitted January 15, 2022. These comments are attached as Exhibit A herein and incorporated by reference into this response.

- Funding, tax incentives, and financing supports to accelerate innovative research, development, and deployment of carbon capture technologies tailored to the diverse and unique needs of the chemical industry;
- Rapid expansion of national clean energy and carbon abatement infrastructure, including cooperation with state and Canadian government partners in developing an integrated pipeline and sequestration infrastructure; and
- Establishing clear, timely, and predictable regulatory pathway for siting and permitting clean energy and carbon abatement projects.

DOE's leadership in these areas can help maintain the US as a favorable destination for manufacturing industries. But while the U.S. is well positioned to lead and solve issues around carbon abatement technology innovation, it will require extensive coordination at many levels ranging from economic, environmental, and chemical management policies to societal engagement across the energy and industrial supply chain and infrastructure landscape.

DOE is already making important strides through its support of recent demonstration facilities, the Carbon Negative Moonshot program, its recent Requests for Information, and its ongoing consultations with industries on industrial decarbonization technology and research needs. We encourage DOE to build on these efforts to accelerate and diversify research, development, and deployment of new abatement technologies and the innovative materials and chemistries needed to optimize performance and efficacy.

I. Comments on DOE Technical Areas

As reflected above, ACC's members are not only critical users and end markets for carbon abatement technologies, they also supply many of the chemistries, products, and inputs needed for a low carbon economy, including the technologies identified in this RFI. In this context, ACC is pleased to provide comments on the following questions raised in the RFI.[5]

A. Technical Area 1-Point-Source Carbon Capture Technologies and Integrated Capture and Storage Projects

ACC has long appreciated the Office of Fossil Energy and Carbon Management's leadership as an incubator and accelerator for clean energy solutions, particular its increased focus on technologies and solutions tailored to our nation's current reliance fossil-energy and feedstocks within the industrial sector. This focus will be critical as the

[5] ACC is also actively engaged with DOE FECM's sister organizations, the Office of Energy Efficiency and Renewable Energy (EERE) and Office of Advanced Manufacturing Office (AMO) and will provide separate comments in response to the January 27, 2022, RFI addressing other aspects of the industry's decarbonization technology research strategy.

nation develops and transitions to innovative non-fossil alternative feedstocks and materials.

Within the chemical industry, affordable domestic natural gas has made the U.S. a global destination of choice for chemical manufacturers, driving billions of dollars in expansion and new plants since 2010. Natural gas and natural gas liquids are now the primary feedstock, or raw material, used in the U.S. to create thousands of chemical products. Natural gas provides power, and today is often the only adequate source of the heat that chemical plants need to operate.

Many ACC members are exploring alternatives like bio-based and recycled feedstocks, new low or no-emissions energy sources and possible electrification of chemical manufacturing processes. However, adoption of some of these alternatives beyond the demonstration stage is still years if not decades away, making carbon-capture and other fossil-energy based abatement technologies a necessary bridge.

Given this reality, CCUS will be important to mitigate the carbon intensity of heavy manufacturing, including chemical production. The chemicals and petrochemical sector represent the largest source of capturable CO2 from industrial processes. CCUS has the potential to help decarbonize the production of hydrogen, ammonia, and methanol as well as high-value chemicals like ethylene, propylene, and aromatics.

But while CCUS holds considerable promise for some segments of the chemical industry, neither the technology nor the supporting infrastructure is in place to support broad commercial deployment at this time outside a few specific plant types, and most carbon storage capacity and infrastructure remains tied to enhanced oil recovery operations not available in many areas. Government research and funding to identify other use and storage solutions, including the critical chemistries used in their design and operation, are needed for areas where EOR is not viable and to expand the suite of economically viable CO2 utilization options across the economy.

To accelerate the development, commercialization, and deployment of industry-ready carbon capture technologies, ACC encourages FECM to support research and funding into:

- Development of new, lower-cost, lower-energy, and less water-intensive carbon capture technologies suitable to diverse manufacturing emissions streams.
- Support for feasibility studies and demonstration projects for retrofitting of existing plants.
- Integrated CCUS projects from capture through storage which can underpin regional hubs, capturing economy of network and scale.

- Fundamental research into less energy-intensive mechanisms for release of captured CO_2 and conversion of CO_2 to useful products at competitive costs.

- Research into innovative product chemistries used in advanced carbon reduction technologies.

More broadly, multiple deployment and adoption scenarios should be considered while evaluating national technology development strategies. While distributed point-source CC and CO_2 piping to centralized storage hubs is one model, the financial and technological limitations of diverse US industries must be considered.

Additional research into alternative deployment strategies may help to pin-point key technologies that could enable broad CC adoption across industries. This includes but is not limited to:

- The feasibility of centralized hubs that also perform carbon capture for appropriately scrubbed yet diverse exhaust streams may provide additional opportunities to lower the barrier for early adoption.

- Options for supporting a "carbon capture as a service" (CCaaS) ecosystem could also help with adoption and implementation.

Under any strategy, the U.S. will need to create a sound, predicable regulatory and legal framework that provides the clarity and certainty to create markets and encourage private investment in technologies and infrastructure. ACC urges DOE to work closely with its colleagues at the Environmental Protection Agency, Army Corps of Engineers, Council on Environmental Quality, and other agencies to develop siting and permitting procedures for new infrastructure that can accelerate the build-out of low-carbon enabling infrastructure while providing necessary environmental, public health, and community protections.

B. Technical Area 2-Validation of Carbon Storage Resources for Commercial Development

In areas without a market for CO_2 for enhanced oil recovery or the infrastructure to transport carbon to use markets, carbon sequestration capacity will be a necessary pre-requisite for deployment of carbon capture systems – particularly as the US transitions away from fossil fuels and feedstocks. While federal studies suggest that ample deep saline storage capacity exists across most of the country, much of it has not been fully validated and characterized at the level needed to support investment across the full value chain. Federal support is needed to assess and characterize the supply of storage capacity in many areas, particularly during this transition period before a robust CO_2 storage market has developed.

From a regulatory standpoint, long-term liability remains a concern, as does the cost, time, and uncertainty associated with permitting storage sites and associated infrastructure. This uncertainty is likely to increase if community opposition and siting restrictions continue to increase. DOE can help address this by strengthening partnerships with local, state, and federal governments and developers to address community concerns and facilitate project siting and permitting.

For example, ACC urges DOE to work with its EPA partners to assign primacy of the Class VI well permitting process to states programs, including in states like Texas and Louisiana. Texas has been a leader in the regulation and permitting of CO_2 distribution infrastructure and its use in enhanced oil recovery. In June 2001 the governor signed legislation assigning the Texas Railroad Commission (TXRRC) with jurisdiction of Class VI wells, used for deep sequestration rock formations. The legislation was a prerequisite to the state's formal request to EPA for primacy, expected this year. Timely action on this primacy request would help expedite the State's development of critically needed CO_2 transport and storage capacity and serve as a model for other states. Louisiana has already requested primacy and it is expected to be granted this quarter.

C. Technical Area 3-Carbon Dioxide Pipeline Infrastructure at the Regional and National

As noted above, broad deployment of carbon capture, use, and storage technologies is heavily dependent on rapid expansion of the nation's CO_2 hub and pipeline infrastructure. This deployment will be particularly challenging for smaller emissions sources outside of areas where CO_2 can be used for EOR. DOE can help by engaging in cross-sector collaborations with enabling and user industries (e.g., Oil & Gas, Steel, Cement) to co-finance and de-risk hub construction in competitively appropriate ways, including demonstrating feasibility and accelerating permitting.

D. Technical Area 4-Direct Air Capture (DAC) Technologies and Regional Deployment

ACC supports DOE's focus on DAC as a research priority. According to the International Energy Agency, there are 15 direct air capture plants operating worldwide, capturing 9,000t/ CO_2 per year. While this technology is very promising, considerably more federal investment is needed to reduce costs and bring DAC to full-scale deployment.

Products of chemistry will be critical to any future DAC deployment strategy. Many current DAC technologies use chemical sorbents to capture carbon from the flue gas. These technologies have been in use for decades for enhanced oil recovery and have potential for further refinement to reduce energy and capital costs. Membrane-based carbon capture technologies are another promising approach but are still at early technology readiness stages and will require funding for further industrial-scale developments. The development of polymers with high CO_2 selectivity will be essential to making this technology more efficient.

For all potential DAC approaches, DOE should understand that the manufacturing of chemicals and polymers will be critical to the development and deployment of this nascent technology.

E. Technical Area 5-Direct Air Capture Prizes and Requirements

ACC supports the development of prizes for direct air capture, carbon use, and innovative industrial carbon capture projects. These prizes can be valuable incentives for academic, institutional, and private investments into breakthrough technologies in areas that would not typically be pursued under traditional investment models.

As a starting point, ACC encourages DOE to move quickly to implement the $15 million precommercial direct air capture technology prize competition and $100 million commercial direct air capture technology prize competition ($100 million) established in the Infrastructure Investment and Jobs Act.[6]

ACC encourages DOE to consider the opportunity for using innovation prizes for other decarbonization technologies and industries as well. ACC previously endorsed the idea of a "Climate Solutions Challenges" prize competition, introduced in H.R. 3607, the "Fossil Energy Research and Development Act of 2020," which would have established an innovative new "Climate Solutions Challenges" prize competition at DOE, allocating $20,000,000 in funding to reward innovative projects involving carbon capture and beneficial use, energy efficiency, energy storage, climate resilience, and data analytics. [7] Another example of such a program was outlined by the H.R.3282, the Carbon Capture Prize Act of 2019, which directed DOE Energy to carry out a competition to award prizes for technology that reduces the amount of carbon dioxide in the atmosphere, including through direct carbon removal and permanent sequestration.[8]

F. Technical Area 6-Opportunities for Carbon Conversion Technologies and Grant Program

Carbon conversion technologies have the potential to transform the landscape of carbon capture technologies for the chemical industry. The development of cost-effective means for converting CO2 to value-added products would add additional incentives for broad adoption. The economics of carbon capture and sequestration are not favorable and the technology as it stands is seen by many as a cost. It is critical that fundamental research is supported to develop pathways for the economic conversion of CO2 to useful

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[6] Public Law 117-58, *Infrastructure Investment and Jobs Act*, §41005.
[7] *See H.R.3100 - Challenges & Prizes for Climate Act of 2019 (introduced 06/05/2019), available at* https://www.congress.gov/bill/116th-congress/house-bill/3100/text?r=7&s=1.
[8] *See* H.R.3282, *Carbon Capture Prize Act* (introduced 06/13/2019), available at https://www.congress.gov/bill/116th-congress/house-bill/3282?q=%7B%22search%22%3A%5B%22climate+prize%22%2C%22climate%22%2C%22prize%22%5D%7D&r=29&s=2.

products. Some examples of promising technologies have been demonstrated at commercial scale while other remain on the bench. Continued and strong support in this area to enable diversified CO_2-sourced products can substantially incentivize adoption of carbon capture technologies and should help build a thriving ecosystem around the technology.

G. Technical Area 7-Environmental Justice, Engagement & Workforce Development

ACC supports the Administration's focus on making public policy discussions more inclusive to ensure traditionally underrepresented communities have a voice and their concerns are factored into decision making. This will be particularly important in developing a low-carbon economy, as many of the key solutions will require significant changes to existing manufacturing operations, construction of new low-carbon facilities, and rapid expansion of the nation's energy, transportation, and carbon management infrastructure. We look forward to being a constructive partner with policymakers and the environmental justice community in the national and many local dialogues on climate and greenhouse gas abatement policy, environmental justice, and our nation's transition path to a low-carbon economy.

H. Coordination with International Climate Efforts

While the U.S. should continue to lead in clean energy and manufacturing technology development, there are several areas where international coordination would help advance our national efforts.

Coordination on pipeline infrastructure and sequestration capacity is one example. Some of the key pipelines in the US are operated by Canadian entities, and some facilities may be in areas where access to Canadian infrastructure and storage capacity may helpful, if not necessary, for decarbonization efforts. We encourage DOE, DOI, the State Department, and other Agencies to partner with international partners where it can advance shared goals.

II. For further Information

ACC appreciates the opportunity to participate in this important proceeding and hopes its responses in this and the recent Supply Chain RFI can serve as the foundation for a continued discussion with the Department, For further questions or information on the American Chemistry Council or its comments and policy recommendations for accelerated research, development, and deployment of sustainable industrial emission control technologies, please contact me at (202) 297-4420 or Charles_Franklin@americanchemistry.com.

Sincerely,

/s/

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