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Chairman Paul Tonko
Subcommittee on Environment and Climate Change
House Committee on Energy & Commerce
2125 Rayburn House Office Building
Washington, DC 20515

Ranking Member John Shimkus
Subcommittee on Environment and Climate Change
House Committee on Energy & Commerce
2322 Rayburn House Office Building
Washington, DC 20515

Dear Chairman Tonko and Ranking Member Shimkus:

Thank you for the opportunity to provide this statement for the record on your upcoming hearing on "Building a 100% Clean Economy: Pathways to Net Zero Industrial Emissions," to be held tomorrow, 18 September 2019. I work for the ClimateWorks Foundation, a nonprofit 501(c)(3) organization working to solve the climate crisis and ensure a prosperous future.

While I welcome the opportunity to discuss any part of path toward industrial decarbonization, in this letter, I will focus on the following points:

(1) We cannot reach our climate goals without making significant progress on reducing industrial emissions.
(2) There are a number of affordable options already available to reduce industrial emissions starting immediately. The most important thing that government policy can do is to create markets where businesses can be successful by reducing industrial emissions.
(3) Simultaneously, we should invest in research, development, demonstration, and deployment of the technologies that can be commercialized over the coming decade.
(4) The success of all of our efforts rests on a foundation of national technical capacity and clear and transparent emissions accounting, so we must invest in making these available to everyone.

Addressing industrial emissions is not just sensible environmental protection. It is also an opportunity for American businesses and workers to develop technologies, skills, and practices that will be in wide demand around the world in the coming decades, and to renew the American manufacturing and construction sectors.

(1) We cannot reach our climate goals without making significant progress on reducing industrial emissions.

Direct emissions from industrial facilities in the United States are about a fifth of total emissions. If we include the indirect emissions from generating electricity consumed by industrial facilities, that number rises to about a quarter. If we also include the imported industrial emissions generated in other countries while manufacturing products that were

consumed in the United States, that portion rises to a third of national emissions. The trends in these emissions are shown in the figure below. Unfortunately, the flat or declining industrial emissions within the United States are more a result of offshoring of manufacturing activity than of success in reducing the emissions intensity of our economy.

Given these high emissions, it will not be possible to prevent the worst impacts of climate change unless we make significant and rapid progress on reducing our industrial emissions. Fortunately, this can be very cost effective.

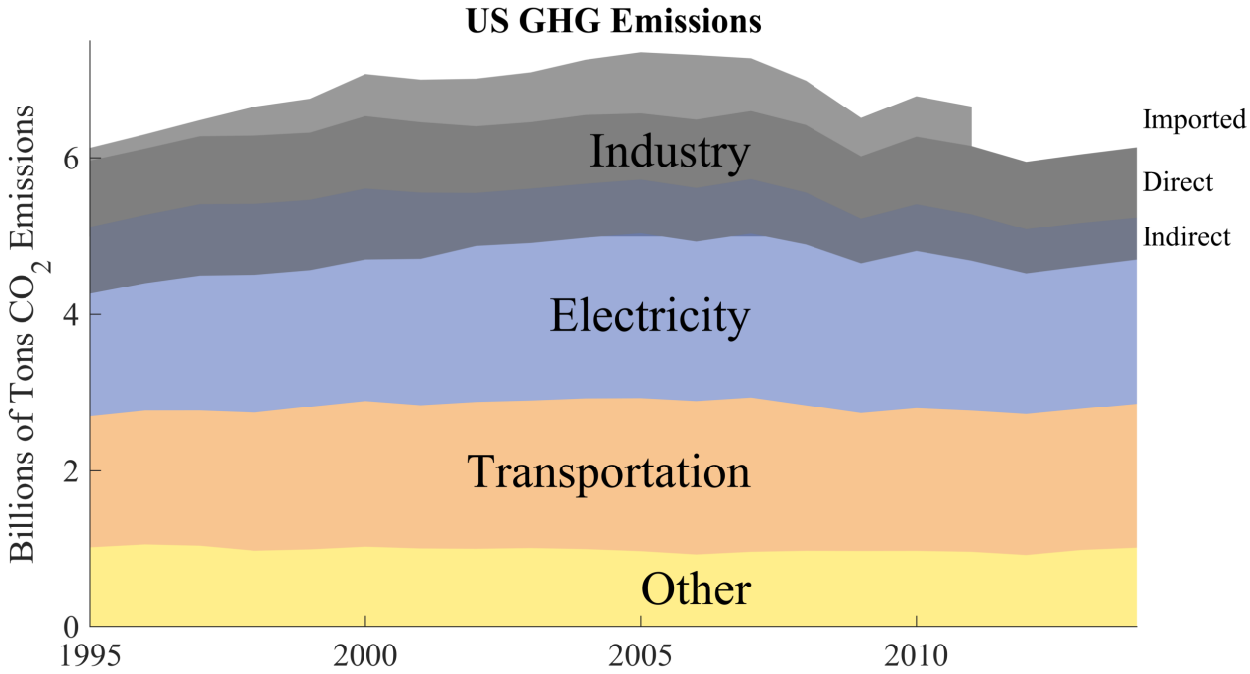

Figure. U.S. national GHG emissions. Note the imported emissions have not yet been calculated for recent years and are omitted. Sources: EPA (2019), International Energy Agency (2017), Organization for Economic Cooperation and Development (OECD) (2016).

(2) There are a number of options already available to reduce industrial emissions starting immediately. The most important thing that policy can do is to create markets where businesses can be successful by reducing industrial emissions.

Industrial emissions are heavily concentrated in a small number of commodity processing industries, especially petrochemicals (largely fertilizer and plastics), refining, steel manufacturing, cement making, pulp and paper, and aluminum. Efforts to reduce industrial emissions should likewise be concentrated in these sectors. In order to reduce these emissions, we can make changes at the industrial facilities. We can also make other changes throughout the economy to increase the amount of valuable services that these materials provide and so decrease the need for new materials. By reducing the amount of material needed to make a given product, improving recycling and high-value material recovery, and increasing the utilization rate of our products, we will reduce industrial emissions. These types of options are often called 'material efficiency,' in analogy to energy efficiency.

There are usually few technological barriers to improving material efficiency. In addition, there are a number of emissions-reducing technologies that are ready to be deployed, but have not been because of a lack of market signals. Examples of things we could do immediately with existing technology to substantially reduce industrial emissions include:

- Typical commercial buildings use 50% more structural material than is required to comply with the already safety protective building codes. By optimizing the design and construction, we could substantially reduce demand for structural steel and cement.
- Today only about 10% of plastic is actually recycled, and often the recycled products are very low value. Plastic packaging could be simplified to allow for easier and higher-value recycling.
- The U.S. uses the most GHG-intensive cement in the world. We could modify the way we mix cement and concrete, using formulations widely used around the world and by many state Departments of Transportation, and both reduce GHG emissions and improve the durability and performance of the concrete.
- Carbon capture and storage could be used as a retrofit at existing industrial facilities or integrated into the design of new industrial facilities, using widely deployed technologies like amine scrubbing. Retrofits will likely be able to capture 30-50% of GHG emissions from facilities, but new builds could capture much higher rates.

None of these interventions would require new technologies, and each of them would reduce our industrial emissions by potentially tens of millions of tons of CO_2 per year. None will significantly increase the cost of the products involved. The reason that we have not done any of them is that there do not exist markets where businesses can make a profit by doing them.

The most important thing that federal policy can do to reduce emissions in the industrial sector is to create those markets. This could be through:

- *Administrative actions*, like creating low-carbon procurement requirements for federally-funded construction projects;
- *Regulatory actions*, like setting a GHG intensity standard on carbon-intensive types of products or limiting the range of plastic types in disposable packaging; and
- *Fiscal actions*, like creating a production tax credit for industrial commodities like hydrogen gas (H_2) in analogy to the wind power production tax credit, or a contract for differences for the cost difference between high- and low-emissions production.

It is so important for federal policy to focus on creating markets for low-carbon commodities for three reasons:

(1) Businesses cannot make investments in lower-carbon production—including building or upgrading facilities, hiring and training workers, and developing new products—unless they are *confident that markets will exist for those products*. Many lower-carbon materials are more expensive, especially as we are learning how to best produce, use, and dispose of them. No one will take the risk and expense of retrofitting a cement kiln with CCS unless they know they can get a premium price for the cement it produces. Commitments through public procurement systems are one of the most powerful ways to provide that confidence, and the public sector purchases half of the cement and a sixth of the steel in America.

(2) By focusing on market creation, we *eliminate the competitiveness concerns* that many previously discussed policies raise. We are not putting any requirements on American businesses that offshore businesses could avoid, as might happen with a carbon price or direct regulation of the emissions of domestic facilities. All producers regardless of location access the markets for low-carbon products and processes that we can create, so there's no risk of undercutting by non-compliant competitors. Additionally, domestic producers would have the advantages of lower transportation cost, greater understanding of the markets, and easier compliance with domestic requirements. In many industries, like steel, U.S. producers are already considerably cleaner than the global average.

(3) Most importantly, from the perspective of the final consumer, the cost of reducing emissions from the industrial sector is negligible. For example, if it costs $100 per ton to capture and store CO_2 from a hypothetical cement plant, that would almost double the costs at the plant—very hard to afford. However, it would only add $500 to the cost of a single-family home or $10 million to the cost of a $1 billion bridge. The final consumer can afford the costs of decarbonizing much more easily than the original commodity producer. By focusing on market creation, we ensure that the costs of decarbonization go to the people best able to afford it.

By creating markets that reward low-emissions ways to make and use carbon-intensive products, we will improve our environment, get useful new technologies deployed, drive costs down, and ensure that American workers and businesses are not put at a disadvantage. We do not have to choose between solving climate change and a prosperous economy.

(3) Simultaneously, we should invest in research, development, demonstration, and deployment of the technologies that can be commercialized over the coming decade.

At the same time as we create markets to deploy the options we already have, we should be working to develop new technologies that can come online over the next decade. These include both zero-carbon production pathways for key materials—steel, cement, plastics, ammonia, aluminum, paper—and much better recycling pathways for these materials. Each subsector will require its own innovation and commercialization options. These might include:

Steel	Cement	Chemicals
Hydrogen reduction	Electric kilns	Carbon-free H_2 gas
Direct electrolysis	High capture rate CCS	Chemical recycling
Copper separation in recycling	Prefabrication and precision molding	Electric process heat
New CCS production pathways	Low-clinker mixes	Plastic sorting and control
	Alternative chemistries	CO_2 separation

An appropriate innovation program for the industrial sector should include activities from the lab to actual deployment of first-few-of-a-kind facilities. It should be in partnership with the industries in question and include strong components for developing technology roadmaps and providing technical assistance to both firms and subnational governments to ensure that the new technologies are actually taken up. Sufficient investment would be at the scale of at least several billion dollars per year for innovation activities, with more needed for deployment. To appreciate the urgency of these activities, consider a typical investment timeline for a large piece of industrial capital. If a company decides today that it is serious about building a new steel mill using hydrogen reduction, it would be followed by a front-end engineering study that would typically take two years, followed by more detailed design and engineering, a final investment decision, contracting, and construction. That means a priority project with no major technological hurdles might come online in seven years. To reach our climate goals, we need to be ready for widespread deployment of near-zero emissions technologies starting in 2030, so the early projects need to be approved in the next couple years.

When we look out over the coming decades, we can see that the options available to reduce industrial emissions change over time. We can improve operational efficiency at existing facilities, shift production to higher-performing facilities, and start substituting lower embodied emissions materials immediately. Over the next couple years, we can create niche

markets for low-carbon materials and products. Over the next five to ten years, we can deploy the first few of a kind of new process technologies, retrofit existing facilities, and significantly improve our waste recovery and recycling systems. It will take ten to twenty years for the lessons of material efficiency to really penetrate into architecture, engineering, and product design and to start widespread deployment of new process technologies. We need to begin all of these processes immediately.

(4) The success of all of our efforts rests on a foundation of national technical capacity and clear and transparent emissions accounting, so we must invest in making these available to everyone.

Expertise and high-quality information are the foundation of any successful endeavor and public goods with enormous spill-overs. Currently, as a nation, we have a severe shortage of these for low-carbon industrial systems and engineering. There is a clear federal role to invest in these public goods with activities like:

- Training and technical assistance funding in all clean industry innovation activities. These should include workforce development, training for the relevant skilled trades, and training for engineers, designers, and scientists.
- Improved public data sets on industrial facilities and their key assets, relative performance of U.S. and international facilities, and the cost and performance of various technologies.
- Improved modeling of the industrial sector within existing energy models like DOE's National Energy Modeling System (NEMS), to include all relevant technologies, material flows between sectors, and material efficiency interventions.
- Improved calculations of consumption-based U.S. GHG emissions.
- Public and validated methodologies for accounting for the embodied emissions in significant products like buildings and vehicles. These must include facility-specific emissions information for all relevant materials, as there is enormous variation in the environmental performance of different facilities making the same product. These also must include appropriate verification, so the methodologies can be used for government activities by federal, state, local, and tribal agencies.

Without high-quality people and information, all of our other efforts cannot succeed.

In conclusion, the industrial sector is essential to meeting our climate goals, we have good options for reducing industrial emissions today an in the future, and there is a clear role for the federal government in supporting the knowledge, information, technologies, and markets to make that happen. If we design our policies correctly, this effort can increase the competitiveness of American firms and the strength of our manufacturing sector.

Sincerely,

Rebecca Walsh Dell, PhD
Industry Strategist
ClimateWorks Foundation