

**United States House of Representatives  
Select Committee on the Climate Crisis**

**Hearing on September 10, 2019  
“Solving the Climate Crisis:  
Manufacturing Jobs for America’s Workers”**

**Questions for the Record**

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**The Honorable Kathy Castor**

- 1. Could you please describe overall funding levels for federal energy innovation efforts? In the context of the climate crisis, are these levels adequate and are there any areas that deserve special emphasis?**

The last comprehensive official survey of U.S. Government clean energy R&D funding levels was completed in 2016. At the time, the Office of Management and Budget found that Congress had enacted \$6.4B in clean energy R&D funding in FY 2016 across the government, \$4.8B (or approximately 75%) of which was appropriated to the U.S. Department of Energy (DOE).

Since then, Congress has increased funding to DOE’s science and clean energy programs by about 20%. Congress deserves credit for increasing DOE funding even as the current administration has proposed gutting federal energy innovation programs.

Even so, the rate of increase in energy innovation funding is not fast enough. Along with nearly two-dozen other countries, the United States committed to doubling its national clean energy innovation programs between 2016 and 2021. Other countries are making good on their commitments. If the United States does not, the jobs and economic opportunities associated with these types of catalytic government investments will flow to the countries that are stepping up to the plate.

In the United States, we are particularly underinvested in energy innovation in the transportation, buildings, and industrial sectors, in comparison to their shares of greenhouse gas (GHG) emissions. Congress should more than double clean energy innovation efforts in these areas.

- 2. In your testimony, you mentioned that there are programs at the U.S. Department of Energy (DOE) that focus on industrial efficiency improvements. Should the mandate for these programs be updated in the context of the climate crisis, and if so, how? Please feel free to reference specific DOE programs.**

The U.S. industrial sector is the source of about 22% of our GHG emissions. DOE's Advanced Manufacturing Office (AMO) works to help reduce these emissions by improving energy efficiency in our nation's factories. While there is much more to do to improve the energy efficiency of our industrial processes, there are thermodynamic limits on how much efficiency can be achieved. In other words, the industrial sector will always generate some greenhouse gas emissions even if energy efficiency is implemented fully. Therefore, to get to net zero by 2050 (as is required to prevent the worst impacts of climate change), industry must capture those remaining emissions.

Given the research challenges and large capital requirements of innovation in this area, the federal government needs to lead the way. Carbon capture, utilization, and sequestration (CCUS) technologies, electrification of process heat, and substitution of low-carbon fuels for fossil fuels hold promise for the industrial sector but need more research to reduce costs and commercialize.

The current legislative authorization for DOE, last updated in 2005, does not mention climate change (Energy Policy Act of 2005, Section 902). In addition, the authorized goals for AMO (Energy Policy Act of 2005, Section 911) are exclusively focused on industrial energy efficiency. So much has changed in our energy sector since 2005. Congress should comprehensively update DOE's statutory goals to include climate considerations, both at the agency level, and to authorize AMO to develop a broader set of industrial decarbonization solutions, including industrial CCUS technologies. H.R. 3978, the Clean Industrial Technology Act of 2019 would promote this goal.

In addition, DOE should elevate the level and widen the focus of its buildings and industrial RD&D by raising the level of the office from the current Deputy Assistant Secretary for Energy Efficiency to a new Assistant Secretary for Buildings and Manufacturing.

**3. In your testimony, you mentioned the potential for offshore wind development in the United States. What policies should Congress adopt to scale up deployment of this vast, clean resource?**

DOE estimates that more than 2,000 GW, or two times the combined generating capacity of all U.S. electric power plants of offshore wind resources exist in the state and federal waters of the United States and the Great Lakes. While not all of this will be realistically developed, to date, we have 30 MW of operating offshore wind in the U.S. That equals .0015% of our potential capacity.

Furthermore, these offshore wind resources are near coastal population centers, which need new clean energy resources, but face onshore land constraints. In addition to funding additional research into offshore wind technologies, Congress should extend the federal Investment Tax Credit for offshore wind. Without action, the credit is set to phase out this year, cutting off investments in offshore wind, just as the costs for this technology is beginning to support widespread deployment. In addition to extending the tax credit for offshore wind, Congress should consider mechanisms to facilitate investments in transmission infrastructure to bring the robust offshore wind energy to load centers.

**4. In your testimony, you mentioned that DOE appliance standards have saved consumers almost \$1 trillion dollars. Could you please describe additional ways that new technologies can help consumers save money? What are some examples?**

DOE's appliance standards program sets minimum efficiency levels for 60 commercial and consumer products, such as refrigerators, lighting, washing machines, dryers, and heating and cooling systems. Working with industry, this program brings together manufacturers, consumer advocates, environmental advocates and states to continually raise the game on the efficiency of appliances in our homes and businesses.

The standards program has driven remarkable efficiency gains in household appliances and equipment. For example, today, the typical new refrigerator uses one-quarter the energy than in 1973— despite offering 20% more storage capacity and being available at half the retail cost. Since 1990, new washing machines use 70% less energy, air conditioners use 50% less energy, and dishwashers use 40% less energy.

Overall, these standards already help save consumers \$1 trillion over the past 30 years, and will save them another \$1 trillion over the next decade. Put another way, the program has helped the average family nearly \$500 per year through lower energy bills. This also has the effect of reducing GHG emissions.

Congress requires DOE to update these standards every six years, but the current administration has slowed this process, and in some cases is attempting to roll back existing standards. Over time, this will mean that Americans will pay higher energy bills and emit more GHGs than they would if DOE was updating these standards.

Doing so also weakens U.S. industry. American manufacturers are always at the technological cutting edge, and they are the best positioned globally to develop new products that meet energy efficiency standards. By rolling back these standards, the current administration is giving foreign competitors with inefficient technologies an advantage over domestic companies. DOE should instead be strengthening the standards, which would increase energy efficiency and save consumers even more money on energy costs.

**5. In your testimony, you mentioned how policies could be strengthened to ensure that projects that receive funding from DOE have domestic manufacturing plans. Could you expand upon what Congress should do to better safeguard domestic production of taxpayer-funded technologies?**

Under a provision of the Bayh-Dole Act, DOE's Energy Efficiency and Renewable Energy (EERE) and Advanced Research Projects Agency-Energy (ARPA-E) programs require award applicants to submit U.S. Manufacturing Plans. These plans state an awardee's commitment to manufacture technologies resulting from DOE awards in the United States.

Congress should ask DOE to strengthen this requirement by applying it to all applied energy RDD&D programs (not just EERE and ARPA-E) and to develop recommendations for

strengthening proposed manufacturing plans. Specifically, the current law gives the Federal government very few mechanisms to enforce the commitments that awardees make in their plans. At most, DOE could bar an entity that violated the terms of its U.S. Manufacturing Plan from competing for future awards.

Stronger mechanisms could include clawback provisions for offshored intellectual property or financial compensation for U.S. taxpayer sponsored technology that is manufactured offshore. DOE is well suited to address the pros and cons of strengthening the requirements and enforceability of these plans.

**6. In your testimony, you mentioned that support from DOE programs, particularly in the Advanced Manufacturing Office, helped drive down the price of clean energy technologies. Could you please provide examples of how the Manufacturing USA Institutes have produced real results for the U.S. economy and clean energy in particular? How could Congress help these existing institutes meet the scale of the climate crisis?**

The Manufacturing USA Institutes are a national network of federally sponsored manufacturing institutes, each with their own technological concentration, but designed to accelerate U.S. manufacturing as a whole. DOE sponsors six of these institutes, focusing on topics like solid-state power electronics, advanced composites, and chemical manufacturing.

The first of these institutes, Power America, is approaching its fifth year in operation. Based on manufacturing advances developed at Power America, a foundry in Texas is the first in the world to manufacture 6-inch Silicon Carbide (SiC) wafers. SiC semiconductors represent a revolutionary new design for computer chips. Computer chips are at the base of the supply chain for every clean energy technology – so if we can build them here, we have an advantage when it comes to building all the things they are in as well – from solar technologies to electric vehicles (EVs) and beyond.

Congress and DOE originally agreed to support these institutes for five years, at which time they would become self-sustaining. Other countries with similar technology-specific clean energy manufacturing institutes support their entities indefinitely. This is because experience shows that it takes more than five years to build enterprises on the scale of these institutes. Congress and DOE should work together to determine a new, competitive funding mechanism to support these institutes after their initial five years of funding ends. The advances they have made are substantial, and the investments U.S. taxpayers have made risk being stranded without additional federal support. In addition, because the model has been so successful, Congress should ask DOE to identify new potential topic areas that would be well suited for the institute model.

**7. What are other countries doing to secure their piece of the market in the global clean energy economy? What can we learn from them?**

Other countries have holistic, sector-centric models to address the climate crisis. For example, some countries like the U.K. have set overall carbon budgets by sector and then are applying a

comprehensive range of solutions, including R&D, market and deployment incentives, workforce development, and regulation to achieve their goals.

Yet other countries are examining future technologies on a case-by-case basis and deciding if they want to lead the market. For example, a decade ago, China looked at solar PV manufacturing and decided to become the world leader. Because of their expertise in solar manufacturing, they are now a world leader in semi-conductor manufacturing, which has enabled them to become a world-leading computer manufacturer. And because future clean energy products like EVs are heavily digitized, they now have an advantage in that space.

The United States should be looking at the future clean energy business in much the same way other countries are – based on both the moral imperative and the size of the economic opportunity. Upon examining technologies like next generation solar, offshore wind, EVs, carbon capture, advanced nuclear, renewable hydrogen, energy efficient appliances and others, we would recognize that we have historical strengths in each of these areas.

With the right combination of catalytic tools from the federal government, we can lead the world on each of these technologies. But it takes a comprehensive array of federal programs, not ad hoc, one-time interventions by Congress and the federal agencies.

**8. Congress has provided incentives to wind and solar companies to expedite deployment of this zero-carbon source of electricity. When crafting these incentives, how can Congress ensure workers benefit from this expanding sector?**

For those wind and solar products that are imported into the U.S., Congress should ensure that trade agreements with the countries they are manufactured in include rigorous labor and environmental standards. In other words, American workers who build solar panels and wind turbine components should not be penalized for making a fair wage or building them without destroying the environment. A number of trade deals are in various stages of development with countries that send their solar and wind products to the U.S. at the moment, so this is a crucial time to ensure such protections are put in place.

## The Honorable Ben Ray Luján

- 1. Given the magnitude of the industrial decarbonization challenge, I'd like to ask you, Mr. Shah, on how we can begin to address such a problem. Given that we need to reduce emissions from a wide range of manufacturing processes, such as steel, iron, aluminum, concrete, chemicals, and a whole host of other products that are essential for our economy, are there existing technologies that we can build and learn from and adapt to suit the needs of reducing emissions from manufacturing?**

This is an important question because the Environmental Protection Agency reports that 22% of U.S. emissions come from the industrial sector. When examining the range of solutions by sector, industry is generally thought of as the most difficult to decarbonize from a technological perspective. On the other hand, industrial emissions are well known, and relatively concentrated, which means that once we begin to apply solutions, they can make a big difference quickly.

The solution set is two fold. One, there must be a financial imperative for industry to decarbonize. Right now, there is no a market signal that would either incentivize or disincentivize industry to pollute. Incentives could come in the form of a tax credit for reducing emissions, either through efficiency, electrification, low-carbon fuels, or carbon capture, utilization, and storage (CCUS). The 45Q tax credit is a start, but without clear guidance from IRS, remains difficult for companies to access. Even after guidance is promulgated, more incentives are required. Disincentives to pollute can also spur action. For example, implementing a price on carbon pollution would also stimulate quick action to reduce GHGs from industry.

For these financial incentives to work, we also need new technological solutions for industrial energy efficiency and CCUS. For 2019, Congress appropriated \$320 million for DOE's Advanced Manufacturing Office, or less than 1% of DOE's overall appropriation. There is a huge array of energy innovation options for industry, but we are not examining them robustly because we have not made it a funding priority. More funding is needed. In addition, the authorized goals for AMO (Energy Policy Act of 2005, Section 911) are exclusively focused on industrial energy efficiency. As Congress considers updating DOE's statutory mandate, it should authorize AMO to perform research on industrial CCUS technologies.

- 2. When we talk about innovation in the manufacturing sector, we are going to need to find new ways for the federal government to partner with the private sector, academia, and philanthropy. We have seen some agencies establish non-profit foundations to better support their missions. For example, the Foundation for the National Institute of Health has raised over \$1 billion dollars and supported over 550 projects. I have introduced the bipartisan, bicameral IMPACT for Energy Act, which would create a foundation for the Department of Energy. Should we consider these models to accelerate the development and deployment of clean energy technologies at the Department of Energy? How could a non-profit alongside the Department of Energy assist the Department in its mission and better leverage federal resources?**

99% of U.S. energy infrastructure is in the hands of the private sector. That means that the federal government cannot transform our energy mix without active participation from the private sector. That is why accelerating the commercialization of research and technology through increased access to private sector funding and new models for public-private partnership is critical.

As it has done with other federal agencies, a DOE Foundation could be an important tool to address early-stage gaps in the energy innovation cycle, which are hampering DOE's ability to spur the adoption of transformative technology in the market. Congress rightfully included a study by the National Association of Public Administration in the FY2020 appropriations to look at this question, because there is a lot to learn about what this opportunity could deliver.

In general, new energy technologies have a particularly difficult time getting to the market because they require a significant amount of capital and very long commercialization timelines. They also are deployed into an incumbent dominated market with large barriers to entry. These barriers could potentially be overcome through unique partnership models created by a foundation where communication and collaboration between the private sector and the DOE can be facilitated. These models have already been demonstrated by the Foundation for the National Institutes for Health and the CDC Foundation.

Over the last several years DOE has experimented with hubs, consortia, Energy Frontier Research Centers, and institutes. These new research models are important funding experiments. The DOE Foundation could serve as another model - one built off of an already proven experiment - and I encourage DOE and Congress to further consider the idea.

## **The Honorable Mike Levin**

### **1. Mr. Shah, in your testimony, you described the California “Buy Clean” procurement policy. How does a “Buy Clean” policy incentivize U.S. manufacturing?**

The State of California recently instituted a policy that requires the state to take the emissions related to producing steel, glass, and insulation from different manufacturers into account. For example, all things being equal, if one steel company produced lower emissions steel than another, the State would give that company preferential treatment in purchasing.

The federal government is a huge purchaser of finished goods and construction materials. This, for example, includes cement and steel for federal highways, glass and concrete for housing projects, and vehicles for the federal fleet. If the federal government instituted a similar set of ‘buy clean’ provisions, it would incentivize competition among producers to reduce the amount of GHGs released when manufacturing their products.

### **2. If Congress were to adopt a Federal “Buy Clean” policy, what essential elements would need to be part of the policy?**

“Buy clean” policies must apply equally to all products, regardless of whether they are produced inside or outside of the U.S. Without such a provision, manufacturers could be incentivized to produce highly polluting products outside of the U.S. for import, harming domestic manufacturing.

The monitoring and verification of companies GHG certifications are also important. Many proposed or enacted ‘buy clean’ policies around the world rely on established eco-labels or other certification programs. However, not all certifications are created equal, so strong rules need to be put in place early to make sure companies are operating on a level playing field.

In addition, acquisition officials should be able to examine the overall life-cycle costs of a product, to include weighing the long-term environmental benefits of a clean product, as opposed to simply awarding a contract to the lowest bidder.

Finally, federal agencies should be able to continuously raise the bar for purchased products, as lower GHG options appear on the market, without seeking additional authorization from Congress.