FROM LAB TO MARKET: ACCELERATING OUR PROGRESS TOWARD ECONOMIC RECOVERY AND A CLEAN ENERGY FUTURE

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY

OF THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

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July 17, 2020

FROM LAB TO MARKET: ACCELERATING OUR PROGRESS TOWARD ECONOMIC RECOVERY AND A CLEAN ENERGY FUTURE

FRIDAY, JULY 17, 2020

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Subcommittee met, pursuant to notice, at 1:33 p.m., via Webex, Hon. Lizzie Fletcher [Chairwoman of the Subcommittee] presiding.

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY
U.S. HOUSE OF REPRESENTATIVES
HEARING CHARTER

From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future
Friday, July 17, 2020
1:30 PM EST
Cisco Webex

PURPOSE

The purpose of this hearing is to examine technology transfer activities at the Department of Energy (DOE) and their potential contributions to economic recovery from the current COVID-19 pandemic. The hearing will focus on two bills. The first, the draft *Energizing Technology Transfer Act*, would authorize a series of activities for DOE to support and administer programs to accelerate the commercialization of clean energy and other technologies relevant to the mission of DOE, including those developed at the national laboratories, and to modernize the management and administration of demonstration projects and prize competitions, among other activities. The second, the *Increasing and Mobilizing Partnerships to Achieve Commercialization of Technologies (IMPACT) for Energy Act* (H.R. 3575) introduced by Rep. Ben Ray Luján, would authorize a non-profit foundation to "channel private sector investments that support efforts to create, develop, and commercialize innovative technologies that address energy challenges" in partnership with DOE and other relevant entities.

WITNESSES

- **Ms. Jetta Wong**, President, JLW Advising and Former Director, Office of Technology Transitions, U.S. Department of Energy
- **Ms. Jennifer States**, Director for Blue Economy, DNV GL and Project Director, Washington Maritime Blue
- **Ms. Farah Benahmed**, Climate and Energy Policy Advisor, Third Way
- **Dr. Emily Reichert**, Chief Executive Officer, Greentown Labs
- **Dr. Lee Cheatham**, Director of Technology Deployment and Outreach, Pacific Northwest National Laboratory

BACKGROUND

Investment in innovation is key to ensuring a strong economic recovery from crises like the ongoing COVID-19 pandemic.[1,2,3] Innovation is often measured in several intersecting ways. For example, the annual Bloomberg Innovation Index relies on a combination of factors to calculate a country's level of innovation, including patent activity, manufacturing output, and density of high-tech companies. While the United States has made significant investments in all of these areas, it ranked 9th globally on the Bloomberg Innovation Index in January 2020.[4]

Federal programs to improve U.S. innovation can take many forms. In April 2019, the National Institute on Standards and Technology published a report outlining existing barriers to and recommendations for improving American innovation and U.S. economic competitiveness. The recommendations included supporting entrepreneurship programs at federal R&D agencies, enhancing access to federal technologies, facilities, and resources, and expanding federal partnership mechanisms through non-profit foundations.[5] These and other technology transfer activities supported by federal agencies can help further the commercialization of research investments.

While federal investments in innovation are crucial for the commercialization of technologies in a variety of sectors, energy technologies face unique obstacles to successful commercialization. Such barriers include high up-front capital costs, long development times, and the need to displace incumbent technologies.[6] Therefore, federal programs dedicated to furthering the development of clean energy technologies are essential to securing a clean energy future.

DOE Office of Technology Transitions

The DOE Office of Technology Transitions (OTT), established in 2015, is DOE's primary investment in technology transfer activities. The mission of the office is "to expand the commercial impact of the Department of Energy's research and development portfolio to advance the economic, energy, and national security interests of the Nation".[7] In 2018, the Technology-to-Market program under the Office of Energy Efficiency and Renewable Energy was incorporated into OTT, making OTT the central office for all matters relating to technology transfer and commercialization at DOE.[8] In FY20, OTT received $14 million in appropriations.

DOE national laboratories are home to a wide range of innovative discoveries. OTT works with the national laboratories to support efforts to commercialize DOE RD&D investments by

[1] https://www.mckinsey.com/industries/public-sector/our-insights/lessons-from-the-past-on-how-to-revive-the-us-economy-after-covid-19
[2] https://bipartisanpolicy.org/blog/for-a-robust-recovery-invest-in-innovation/
[3] https://www.mercatus.org/system/files/broughel-technological-innovation-mercatus-research-v1.pdf
[4] https://www.bloomberg.com/news/articles/2020-01-18/germany-breaks-korea-s-six-year-streak-as-most-innovative-nation
[5] https://www.nist.gov/unleashing-american-innovation/green-paper
[6] Anadon, Laura Diaz, Matthew Bunn, and Venkatesh Narayanamurti, eds. *Transforming U.S. Energy Innovation*. Cambridge, England: Cambridge University Press, July 2014.
[7] https://www.energy.gov/technologytransitions/mission
[8] https://www.energy.gov/eere/technology-to-market/home

administering several technology transfer programs including: Energy Innovation Corps, which provides entrepreneurial training to national laboratory employees seeking to commercialize their energy-related research;[9] the Technology Commercialization Fund, which awards funding to commercialize technologies developed at the National Laboratories;[10] and the Lab Partnering Service, which provides online and interpersonal services to facilitate information sharing about national laboratory resources, facilities, expertise, and Intellectual Property.[11]

Previously administered programs under the Technology-to-Market program include: the National Incubator Initiative for Clean Energy (NIICE), which fostered coordination and collaboration amongst U.S. clean energy technology incubators and is now overseen by the Electric Power Research Institute;[12] the Small Business Voucher Program, which enabled small businesses to have greater access to DOE national laboratory facilities and expertise;[13] and the Clean Technology University Prize Competition, which administered a university prize competition for clean energy technology business models.[14] Each of these existing and former programs are authorized in the draft *Energizing Technology Transfer Act.*

Non-profit Energy Foundation

Various groups, such as NIST,[15] the American Energy Innovation Council,[16] the Federal Laboratory Consortium,[17] and the Information Technology and Innovation Foundation (ITIF)[18] have recommended exploration of establishing a non-profit foundation to facilitate DOE interactions with private sector partners and accelerate energy technology commercialization. This recommendation follows the establishment of non-profit foundations at the National Institutes of Health[19] and the U.S. Department of Agriculture.[20] This Congress, Rep. Luján introduced the *Increasing and Mobilizing Partnerships to Achieve Commercialization of Technologies (IMPACT) for Energy Act* (H.R. 3575), which would establish a similar foundation model at DOE.

A recent report titled, *Mind the Gap: A Design for a New Energy Technology Commercialization Foundation*, published by ITIF examines the DOE foundation concept within H.R. 3575 and puts forward recommendations for structuring and managing such a foundation. Specifically, the report recommends the establishment of a non-profit Energy Technology Commercialization

[9] https://www.energy.gov/technologytransitions/energy-i-corps
[10] https://www.energy.gov/technologytransitions/articles/department-energy-releases-2020-technology-commercialization-fund
[11] https://labpartnering.org/
[12] https://www.energy.gov/eere/technology-to-market/national-incubator-initiative-clean-energy-niice-0
[13] https://www.energy.gov/eere/technology-to-market/small-business-vouchers
[14] https://www.energy.gov/eere/technology-to-market/cleantech-university-prize-cleantech
[15] https://www.nist.gov/unleashing-american-innovation/green-paper
[16] http://americanenergyinnovation.org/2020/02/energy-innovation-supporting-the-full-innovation-lifecycle/
[17] https://federallabs.org/t2-toolkit/t2-playbook
[18] Wong, Jetta. Hart, David. "Mind the Gap: A Design for a New Energy Technology Commercialization Foundation." Information Technology and Innovation Foundation. Published May 11, 2020. https://itif.org/publications/2020/05/11/mind-gap-design-new-energy-technology-commercialization-foundation
[19] https://fnih.org/
[20] https://www.usda.gov/media/press-releases/2014/07/23/usda-secretary-announces-creation-foundation-food-and-agricultural

Foundation to foster public-private collaboration and clean energy entrepreneurship through access to DOE resources and support for researchers to "more aggressively seek commercial applications for their discoveries." [19]

LEGISLATION

Draft Energizing Technology Transfer Act

The draft Energizing Technology Transfer Act authorizes a series of activities related to clean energy technology commercialization nationally and at the national laboratories and DOE management and administration of demonstration projects and prize competitions, among other activities.

Title I of the bill would authorize a series of programs to enhance commercialization of clean energy technologies across the nation. This includes authorization of regional clean energy innovation partnerships, clean energy technology incubators, university prize competitions, Energy Innovation Corps, and coordination functions.

Title II of the bill would authorize programs to support the commercialization of technologies developed at the national laboratories and facilitate partnerships with the national laboratories. This includes authorization of a Lab Partnering Service, a program to bring entrepreneurial researchers into the national laboratories,[21] a program to provide small businesses with greater access to national laboratory facilities and expertise,[22] entrepreneurial leave and consulting for national lab employees, improvements to the Technology Commercialization Fund (TCF),[23] and signature authority to national laboratory directors for agreements under $1 million.[24]

Title III of the bill would authorize programs to modernize activities at DOE pertaining to its management and funding of technology development and commercialization. This includes authorization of activities for OTT,[25] additional oversight for large-scale demonstration projects, streamlining for DOE prize competitions, an innovative milestone-based approach for carrying out demonstration projects, extension of DOE's other transaction authority, special hiring authority, and reporting requirements.

The draft bill authorizes appropriations on a program by program basis, for a total of $97.7 million per year for fiscal years 2021 through 2023, lowering to $94 million per year for fiscal years 2024 and 2025.

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[21] Adapted from the *Leveraging our National Labs to Develop Tomorrow's Technology Leaders Act* (H.R. 5965) introduced by Rep. Luján

[22] Adapted from the *Promoting Small Business Innovation through Partnerships with National Labs Act of 2019* (H.R. 3574), introduced by Rep. Luján

[23] Adapted from the *Energy Technology Maturation Act of 2019* (H.R. 2495) introduced by Rep. Haaland

[24] Adapted from the *NIMBLE Act* (H.R. 5907) introduced by Rep. Hultgren in the 115th Congress

[25] Adapted from the *Technology Transitions Act of 2019* (S. 2688) introduced by Sen. Cassidy

Increasing and Mobilizing Partnerships to Achieve Commercialization of Technologies (IMPACT) for Energy Act (H.R. 3575)

H.R. 3575, the IMPACT for Energy Act, would establish a DOE affiliated non-profit foundation to engage with the private sector to raise funds and leverage expertise that supports the research, development, demonstration, and commercial application of innovative energy technologies. As a 501(c)(3) organization, the foundation authorized under the bill could also establish one or more for-profit subsidiaries to commercialize clean energy technologies and attract for-profit partners. The Act would further enable the foundation to make awards, facilitate public-private partnerships, organize events to share ideas and engage with the public, and support education and training of new researchers in carrying out its mission.

Chairwoman FLETCHER. This hearing will come to order. I have my gavel. And without objection, I'm authorized to declare a recess at any time.

Before I deliver opening remarks, I want to note a few things because this Committee is meeting today virtually, and there are a couple of reminders for the Members about the conduct of the hearing before we get started.

First, Members should keep their video feed on as long as they are present in the hearing. Members are responsible for their own microphones. Don't start talking when you're muted, as I just did. Please also keep your microphones muted unless you're speaking. And finally, if Members have documents they wish to submit for the record, please email them to the Committee Clerk, whose email address was circulated prior to the hearing.

One more matter before we get going, we may have Mr. Luján, who is not a Committee Member, but may try to join us today. He's very interested in these topics. And if there's no objection, we will allow him to join the hearing.

OK. Hearing no objections, we will welcome Mr. Luján if he's able to join us.

We'll now proceed to our opening remarks and then move on to the panelists.

So, good afternoon, and thank you all to—for being here today virtually, and thank you to our witnesses that are joining us. And I'm excited this afternoon to discuss the importance of advancing the commercialization of new energy technologies as an important component of our economic recovery and—from this ongoing health crisis.

Here in Houston, we're the Nation's energy leaders, and we believe in an all-of-the-above approach. Texas produces more energy than any other State, and we are always coming up with new ideas to do things bigger and better. Texas energy isn't just the way we get electricity; it's an investment in the economic development of our communities and our businesses.

And while my home State of Texas is well-known for being the country's largest oil and gas producer, we are also the largest wind energy producer in the country, we are now tied as the fourth-largest generator of solar power. We're also leading the way in technologies like carbon capture.

The heart of clean energy lies in supporting entrepreneurship, startups, and innovation. Clean energy technology faces unique barriers to commercialization that other technologies aren't subject to, including high upfront capital costs, long development times, and the need to overcome incumbent technologies. That's why we need targeted programs to overcome these barriers and reap the benefits of investing in clean energy.

The Department of Energy (DOE) has championed several important programs to help reduce barriers to commercialization of clean energy technology. This includes programs to commercialize research done at the national laboratories, support clean energy incubators across the Nation, and provide business training and other commercialization assistance to national lab employees and entrepreneurs.

These and other programs help bolster the efforts of our fantastic panelists here today, each of whom contributes to the important mission of strengthening clean energy commercialization. I'm especially pleased to have Dr. Emily Reichert here on a panel from Greentown Labs. This leading clean energy incubator announced last month they would be opening a new incubator right here in my hometown of Houston.

If we do this right, we can position our country to be the clean energy technology exporter to the world. Much like the space race of the 20th century, our Nation is at a critical moment where we can choose to lead the way in developing 21st-century technologies or we could lose that role to other countries who are investing much more in these efforts at this time. I will do what I can to make sure we are leaders, not followers. Investing in clean energy means investing in the economic future not only of Houston, not only of Texas, but of our entire country.

I want to thank again our excellent panel of witnesses assembled today, and I look forward to hearing your testimony.

[The prepared statement of Chairwoman Fletcher follows:]

Good afternoon and thank you to all of our witnesses that are joining us virtually today to discuss the importance of advancing the commercialization of new energy technologies as an important component of our economic recovery from the ongoing health crisis.

Here in Houston, Texas, we are the Nation's energy leaders and believe in an all-of-the-above approach. Texas produces more energy than any other state and we are always coming up with new ideas to do things bigger and better. In Texas, energy isn't just the way get electricity, it's an investment in the economic development of our communities and businesses.

While my home state of Texas is well known for being the country's largest oil and gas producer, we are also the largest wind energy producer in the country as well and are now tied as the fourth largest generator of solar power. We are also leading the way in technologies like carbon capture.

At the heart of clean energy lies supporting entrepreneurship, startups, and innovation. Clean energy technology faces unique barriers to commercialization that other technologies aren't subject to, including high up-front capital costs, long development times, and the need to overcome incumbent technologies. That's why we need targeted programs to overcome these barriers and reap the benefits of investing in clean energy.

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I want to again thank our excellent panel of witnesses assembled today and I look forward to hearing your testimony. With that, I yield back.

Chairwoman FLETCHER. And with that, I would like to recognize Mr. Weber for an opening statement. I'm not seeing Mr. Weber.

VOICE. Mr. Weber is not currently on the call, ma'am.

Chairwoman FLETCHER. OK. I'd like to go ahead. I believe Mr. Lucas is on the call. I think I see him, so, Mr. Lucas, you are recognized for opening remarks if you would like to give them.

Mr. LUCAS. Thank you, Madam Chair. I'm looking forward to today's hearing on Federal technology transfer initiatives, which is incredibly important to the success of U.S. research and development (R&D).

Technology transfer maximizes the return on investments of Federal research dollars by putting groundbreaking technologies and scientific discoveries in the hands of the private sector. It is an essential component of any plan to maintain U.S. leadership in science and technology, and it's why we have a history of bipartisan support for it. And supporting our Federal research enterprise has never been more important.

Today, in addition to the task of recovering from the COVID–19 pandemic and restarting both our economy and our research enterprise, the United States is facing two fundamental challenges to our competitiveness and success as a nation. First, foreign countries, especially China, are threatening to outpace us in science and technology, jeopardizing the long-term stability of our supply chains, research workforce, and technological growth. Second, we must respond to our changing climate and develop next-generation technologies to understand it, address it, and manage its effects.

Back in January, I introduced H.R. 5685, the *"Securing American Leadership in Science and Technology Act*," which creates a long-term strategy for investment in basic research and infrastructure to protect these economic, environmental, and national security interests of the United States. A key provision of this bill is to provide the effectiveness of Federal R&D investments through comprehensive technology transfer reform, which promotes both better collaboration between the Federal Government and private industry using a whole-approach-of-government activity. We need this focus not just at the Department of Energy, but also through the National Science Foundation (NSF), the Environmental Protection Agency, the National Institutes of Standards and Technology (NIST), and the Oceanic and Atmospheric Administration.

We know that our technology transfer capacities are highly diverse and extend well beyond the reach of any one agency. When we consider technology transfer policy, we must ensure that all of our Federal research agencies have tools that they require for efficiently and effectively transferring R&D outcomes to the private sector where they can be utilized by American industry.

Today's hearing gives us the chance to consider legislation to authorize tech transfer activities at the Department of Energy. I believe that limiting our technology transfer discussion to the scope of a single agency's activities, we may be missing out on the big-picture issues, collaborative mechanisms, and innovative new ways to facilitate technology transfer.

That said, I support both the concepts outlined within these bills, commonsense provisions in the regional clean energy innovation partnerships, the small business voucher program, and the establishment of signature authority for national laboratory directors, an issue we have long championed on the Science Committee.

I believe there are important governmentwide lessons to be learned from the technology transfer activities at DOE national laboratories, and I am pleased that we have Pacific Northwest National Laboratory's (PNNL's) Dr. Lee Cheatham with us today. Not only does the doctor serve as the Director of the Technology Deployment and Outreach at PNNL, and Chair of the National Laboratory Technology Transfer Working Group (NLTT), he also brings insight into the broader Federal activities through his service on the National Science Foundation Business and Operations Advisory Committee.

And I also want to thank Chairwoman Fletcher for holding this hearing and all of our witnesses for their testimony today. I commend my friends across the aisle for prioritizing this issue and looking forward to a productive and valuable discussion. I feel confident that by working together we can continue to encourage innovation across the U.S. research enterprise and give our Federal agencies the resources they need to deliver on our national investment in science and technology.

And with that, I yield back, Madam Chair.

[The prepared statement of Mr. Lucas follows:]

I'm looking forward to today's hearing on Federal technology transfer initiatives, which is incredibly important to the success of U.S. research and development.

Technology transfer maximizes the return on investment of Federal research dollars by putting groundbreaking technologies and scientific discoveries in the hands of the private sector. It is an essential component of any plan to maintain U.S. leadership in science and technology, and it's why we have a history of bipartisan support for it. And supporting our federal research enterprise has never been more important.

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First, foreign countries, especially China, are threatening to outpace us in science and technology, jeopardizing the long-term stability of our supply chains, research workforce, and technological growth.

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That said, I support many of the concepts outlined within these bills—common sense provisions like the regional clean energy innovation partnerships, the small business voucher program, and the establishment of signature authority for national laboratory directors—an issue we have long championed on the Science Committee. I believe there are important governmentwide lessons to be learned from the technology transfer activities of the DOE national laboratories and I am pleased that

we have Pacific Northwest National Laboratory's Dr. Lee Cheatham with us today. Not only does Dr. Cheatham serve as Director of Technology Deployment and Outreach at PNNL, and Chair of the National Laboratory Technology Transfer Working Group, he also brings insight into broader Federal activities through his service on the National Science Foundation's Business and Operations Advisory Committee.

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Chairwoman FLETCHER. Thank you so much, Mr. Lucas.

If there are other Members of the Committee who wish to submit additional opening statements, your statements will be added to the record at this point.

[The prepared statement of Chairwoman Johnson follows:]

Thank you, Chairwoman Fletcher, for holding this hearing today, and I would also like to thank our witnesses for participating.

The Department of Energy's technology transfer activities are critical to getting the fruits of our public investments in clean energy research, development, and demonstration into the hands of the American people. Technology transfer takes on many forms, ranging from additional funding to first-of-a-kind technologies, to training scientists to think more about how to commercialize their discoveries, to providing the private sector with greater access to our national laboratories' facilities and expertise.

Every technology's pathway to market adoption is different, but the benefits of their transfer are clear. Technology commercialization leads to licensing revenue for federal and university laboratories, new products and services for the American people, and a more competitive U.S. economy that supports jobs and attracts talent.

We are in the midst of a global COVID-19 pandemic that shows little signs of abating. We have had historic job losses and our economy has suffered significant dislocations. Recovering from this pandemic is going to take time, resources, and leadership. Job creation is going to be a priority, and DOE's technology transfer programs can play an important role in promoting our economic recovery.

In addition to the contribution technology transfer makes to our economic growth, it can also play an important role in our transition to a clean energy future. For example, DOE's Technology Commercialization Fund provides funding to national labs-often in partnership with private sector partners-to commercialize promising lab technologies. These funds and public-private partnerships bring new clean energy technologies one step closer to making a real difference in mitigating the most significant potential impacts of the climate crisis.

But despite DOE's ongoing work, we can and must do more. Providing additional funding to research and demonstrate those technologies is critical, but we'll also need effective technology transfer processes to push resulting inventions into the marketplace as quickly as possible.

With all that in mind, I look forward to hearing from our esteemed panel of witnesses and welcome them to this hearing. Thank you, and I yield back the balance of my time.

[The prepared statement of Mr. Weber follows:]

Thank you, Chairwoman Fletcher, and thank you to our witnesses for being here today. This Committee is no stranger to the work being done at the Department of Energy's National Laboratories. Whether it's synthesizing new materials or pioneering advanced nuclear reactors, the National Labs have an established history of being at the forefront of scientific discovery. But that is just the first step.

The commercialization of technologies, including those that begin at the National Labs, face unique obstacles before widespread utilization or deployment. Those obstacles include lengthy development times, high upfront costs, and lack of desire to replace current technology. It is what we so often hear referred to as the "Valley of Death."

That is why DOE established their Office of Technology Transitions (OTT) in 2015. OTT's goal is to foster partnerships that guide innovations from the lab into the marketplace by streamlining access to information and to the National Lab's user facilities. One example of this is their development of the Lab Partnering Serv-

ice (LPS), which connects investors to experts, competitive technology, world-class facilities, and partnering opportunities.

Today's hearing is a legislative one, as we review several DOE tech transfer bills. The first, a draft version of the *Energizing Technology Transfer Act*, authorizes a broad range of DOE's tech transfer activities including many helpful provisions for the DOE national laboratories. I agree that there exists an opportunity to improve technology transfer between DOE and private industry by enhancing coordination and cutting red tape.

We can require DOE to maximize return on R&D investment by better managing research efforts across the Department to save money, reduce waste, and prevent duplication. But I hope we don't waste this opportunity today, and on this legislation, by focusing most of our attention on the narrow field of clean energy technology. Don't get me wrong, I understand that clean energy technologies face unique challenges when it comes to the entering themarketplace, but on an issue as important as this and on a portfolio as broad as DOE's, we cannot afford to have tunnel vision on a singular issue.

Federal tech transfer authorities like OTT can accelerate the adoption of advanced technologies over a wide range of areas. For example, recently, we've seen OTT go live with a COVID-19 portal can quickly connect experienced researchers with information about facilities that may be useful in their efforts to contribute to the fight against the pandemic.

As we evaluate how to respond to today's current public health crisis, it is clear that clean energy technologies, while important, are just one part of the bigger picture. There are so many more opportunities for innovation in this time of economic recovery. We cannot afford to limit ourselves to one option and be caught flat footed when the next challenge presents itself down the road.

I look forward to hearing from Dr. Lee Cheatham, the Director of Technology Deployment and Outreach at Pacific Northwest National Laboratory on this topic of broad DOE tech transfer applications. Dr. Cheatham will provide a unique perspective as he has hands-on experience with DOE tech transfer related to digital recording, a more resilient power grid, threat awareness and detection, and cancer treatment.

We'll also use today's hearing to review the *IMPACT for Energy Act*, which establishes a DOE affiliated non-profit foundation that would perform outreach to the private sector. While I believe this could be a useful tool for the National Labs to share ideas and engage with the public and increase training of new researchers, I am concerned that this bill does not include specified funds to be authorized. I hope today we can hear suggestions on just how much this effort will cost and what specific authorization levels are needed for its success.

Again, I want to thank our witnesses for taking the time to be with us today. I look forward to a productive discussion with recommendations on how to improve the legislation before us.

This is the proper legislative process and I want to applaud the Chairwoman for attempting to make this as open and bipartisan as possible. Thank you Chairwoman and I yield back the balance of my time.

Chairwoman FLETCHER. And at this time I will go ahead and introduce our witnesses. First, we have Ms. Jetta Wong. She's President of JLW Advising and Senior Fellow in the Clean Energy Innovation Program at the Information Technology and Innovation Foundation. She's also former Director of the Department of Energy's Office of Technology Transitions (OTT). Before her time at DOE, Ms. Wong served as a staff member for the House Science Committee and held positions with the Union for Concerned Scientists and the Environment and Energy Study Institute. Welcome back to the Committee, Ms. Wong.

Ms. Jennifer States is the Director for Blue Economy at DNV GL and the Project Director at Washington Maritime Blue. Her experience includes work at the Port of Los—of Port Angeles, Pacific Northwest National Laboratory, managing a wind energy development company, as well as serving as City Counselor for the city of Sequim, Washington.

Ms. Farah Benahmed is a Climate and Energy Policy Advisor at Third Way. Prior to joining Third Way, she worked in the Department of Energy's Office of Nuclear Energy and at Avar Consulting.

Dr. Emily Reichert is Chief Executive Officer (CEO) at Greentown Labs. Dr. Reichert studied—started her career at Arthur D. Little as a Ph.D. scientist and researcher and then transitioned to become the Director of Business Operations at the Warner Babcock Institute for Green Chemistry before going on to found Greentown Labs.

Last but certainly not least, Dr. Lee Cheatham is the Director of Technology Deployment and Outreach at Pacific Northwest National Laboratory. Before joining PNNL, Dr. Cheatham led Brookhaven National Lab's Office of Strategic Partnerships and was Chief Operating Officer and General Manager of Commercialization at the Biodesign Institute at Arizona State University.

I'd like to thank all of you for joining us today. As our witnesses should know, you will each have five minutes for your spoken testimony. Your written testimony will be included in the record for the hearing. When you have all completed your spoken testimony, we will begin with questions from the Members. Each Member will have five minutes to question the panel.

We will start with Ms. Wong and go in the order of introductions, so, Ms. Wong, please, you may begin.

TESTIMONY OF MS. JETTA WONG,
PRESIDENT, JLW ADVISING, AND FORMER DIRECTOR,
OFFICE OF TECHNOLOGY TRANSITIONS,
U.S. DEPARTMENT OF ENERGY

Ms. WONG. All right. So, first of all, thank you, Ranking Member Lucas of the Full Committee, and then of course Chairwoman Fletcher and Ranking Member Weber and all the Members of the Subcommittee. I appreciate the opportunity to appear here before the Committee today to testify on technology transfer and commercialization at the U.S. Department of Energy and to discuss how these activities will contribute to the economic recovery.

Over the coming decades, the world economy must make the transition to low-carbon and no-carbon energy. This transition will require accelerated innovation. The United States' strong support for energy research and development should position it well to lead the global energy transition, but the United States has difficulty moving new technologies from early discovery to scale. No one entity in the U.S. energy innovation system is responsible for bringing new technologies across the fabled valley of death between proof of concept and early adoption into the market. This gap in the Nation's energy innovation system could open the way for China and other countries to capitalize on U.S. investment and thereby reap the economic benefits so badly needed in our country, especially right now.

The two bills up for discussion today will help close this gap. My testimony will cover three important areas to strengthen these bills and DOE's ability to help the country recover from our current economic crisis. First, if Congress wants to increase technology transfer and commercialization at the Department of Energy, it needs to resource and prioritize it with new programs and authorities.

Second, Congress needs to create programs which incorporate demand or user pull through the full innovation process. These programs need to include a diverse network of institutions both public and private, which allow for feedback loops from later stages of the innovation process to earlier ones.

Third, and finally, Congress needs to provide DOE more flexibility to pilot, evaluate, and scale existing and new programs which enable the private sector engagement that I recommended in No. 2.

With these three high-level elements in mind, I commend the Committee for the balanced and thoughtful programs and policies identified in the *Energizing Technology Transfer Act* discussion draft. It authorizes several programs that DOE has piloted and provides important direction and funding for those programs to be successful.

However, the new language for the Technology Commercialization Fund appears to remove the requirement for private-sector engagement and should be reconsidered. Additionally, the draft bill does not fix one of the most vexing issues with the Technology Commercialization Fund, which most people call the "color-of-money" issue. DOE implements a complicated, slow, and restrictive process over several budget lines. This process inadvertently pushes these kinds of projects to the bottom of the priority list for DOE's technology offices. I recognize that this is both an authorizing and an appropriations issue, but I urge the Committee to reexamine the convoluted process and to amend the language to provide more flexibility through one fund with no restrictions to the kind of energy technologies funded.

The reforms in the energizing bill are important, yet more must be done to drive R&D from early stage discovery projects to commercial products. The bipartisan and bicameral bill and the IMPACT bill cosponsored by Mr. McNerney, who I see here, Mr. Casten, and Mr. Tonko—I don't know if he's here today—directs the Secretary of Energy to create a not-for-profit energy foundation, which is one way to drive this kind of activity.

In May, I co-authored with David Hart of the Information Technology and Innovation Foundation a report called "Mind the Gap: A Design for a New Energy Technology Commercialization Foundation," which lays out a vision for such a foundation. The *ETCF Act* would be authorized by Congress to work closely with DOE and would help fill the valley of death by allowing energy innovators access to DOE's tremendous technical expertise and world-class facilities. It would encourage DOE-funded researchers to more aggressively seek commercial applications for their discoveries and connect them with partners, funding, and tools to do so. It draws on the precedent set by other congressionally authorized foundations, and, like those foundations, it would complement and supplement DOE's own activities.

If the United States is to lead the world toward a cleaner energy future and gain the economic, security, and environmental benefits of that leadership, it must fill the gaps in its energy innovation system. Both of the bills discussed today will help fill that gap.

Thank you so much for this opportunity, and I look forward to your questions.

[The prepared statement of Ms. Wong follows:]

Written Statement of Ms. Jetta Wong
Hearing on "From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future"
Subcommittee on Energy, House Committee on Science, Space, and Technology
July 17, 2020

Introduction

Chairwoman Fletcher, Ranking Member Weber, and Members of the Subcommittee, I appreciate the opportunity to appear before you today to testify on technology transfer and commercialization at the U.S. Department of Energy and for the potential for these activities to contribute to economic recovery from the current COVID-19 pandemic. As you know, I was the first Director of the Office of Technology Transitions and served at DOE from 2012 through January of 2017.

It is particularly an honor for me to be here, before this subcommittee, because I was a staffer on this subcommittee before working for DOE. It is wonderful to see familiar faces and to be able to contribute to the great body of work that this committee has put forward over the last several decades to strengthen our economy through science, technology, and innovation policy. Thank you for this opportunity.

The Problem

Over the coming decades, the world economy must make a transition to low-carbon and no-carbon energy. This transition will require accelerated innovation to affordably reduce the carbon footprint of all major emissions sources, including hard-to-decarbonize sectors such as long-distance transportation and manufacturing, as well as electricity and light-duty vehicles where the transition has already begun.

The United States' strong support for energy research and development should position it well to lead the global energy transition. But the United States has difficulty moving new technologies from early discovery to scale. No one entity in the U.S. energy innovation system is responsible for bringing new technologies across the fabled "valley of death" between proof of concept and early adoption in the market. Government and philanthropic funding typically come too early in the process to help would-be innovators get to market, while the private sector (with a few exceptions) prefers investments that pay off more quickly and with more certainty. The same thing can be said for many technologies derived from hard science, including the development of vaccines and new medicines.

This gap in the nation's energy innovation system could put the climate at risk by stalling the transition. It could also open the way for China and other countries to capitalize on U.S. investments. If key technologies are made overseas, the United States will lose out on many of the commercial opportunities the transition will create and its national security could be compromised. If the United States is to lead the world toward a cleaner energy future and gain the economic, security, and environmental benefits of that leadership, it must fill the gaps in its system for commercializing new energy technologies by better connecting the diverse players that make up the innovation ecosystem. Some of the same policies, strategies, programs, and activities that will close the innovation gap for energy can facilitate the commercialization of health technologies as well.

The need for a concerted effort to resource and prioritize the commercialization of new energy technology is urgent. The United States, in spite of its scientific prowess, is not making rapid enough progress toward solving the diverse and difficult decarbonization challenges it faces. The bills we will discuss today will not solve all that ails the U.S. energy innovation system. But they will help DOE to lower the mortality rate of innovators seeking to cross the valley of death and encourage other actors to take actions that would have that effect as well.

My testimony will cover the value of federal laboratories to the economic recovery from COVID-19, some of the main issues related to DOE technology transfer and commercialization which relate to all technology developed at DOE, will provide a high-level overview of how DOE has addressed these issues, and then describe some of the areas which still need assistance. These issues include:

1. Resourcing and prioritizing technology transfer and commercialization;
2. Strengthening demand or "user" pull throughout the innovation process; and
3. Piloting, evaluating, and then scaling good ideas.

I will then briefly examine the Energizing Technology Transfer Act discussion draft and then provide a brief vision and summary of a Department of Energy foundation, similar to the foundation authorized in the Increasing and Mobilizing Partnerships to Achieve Commercialization of Technologies for Energy Act or IMPACT Act (HR 3575).

Federal Laboratories' Contributions to Economic Recovery

Many individuals attribute contributions from the U.S. federal laboratory system to investments made during World War II, but this science and technology infrastructure dates back to the mid-1800s with the establishment of the Smithsonian Institute in 1846 followed by the creation of Agriculture Research Service of the Department of Agriculture in 1862. These early investments, and others, in research and development to understand the world around us brought new technology and practices that shaped the way humans provided food for themselves, communicated, and preserved life through new advances in medicine. Now the federal laboratory infrastructure in the U.S. is made up of over 300 laboratories covering all aspects of science and technology which contribute to a growing innovation economy.

Most recently, federal laboratories have been at the forefront in the fight against COVID-19. New intiatives have provided the country with new medicines, technologies, research, and supercomputing capabilities focused on helping scientists understand and diagnose, and find a treatment for the disease, and eventually develop a vaccine.[1] These kinds of investments not only save lives but provide significant economic benefit to the country. According to a Battelle Institute study from 2013, the total economic impact of close to $1 trillion investment in the Human Genome Project (HGP) since 1988, has provided a 178:1 return on investment.[2] The HGP was led by a collaboration between the National Institutes for Health and the Department of Energy. Ultimately, this collaboration provided the tools and framework for numerous partners to access the data and to collaborate on the development of human medicine, therapies, diagnostics, and other technologies that improve our quality of life.

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[1] DOE Laboratories are part of the COVID-19 High Performance Computing Consortium providing supercomputing systems to researchers to address the epidemiology, bioinformatics and molecular modeling of COVID-19. https://covid19-hpc-consotrium.org.

[2] The Impact of Genomics on the U.S. Economy, Battelle Technology Partnership Practice for United for Medical Research (June 2013).

DOE's national laboratories have already led the way in scientific discoveries related solar power, battery technology, fuel cell technology, LED light bulbs, and dozens of other energy technologies changing the way we use electricity and transport people and goods. They have also strengthened our country's ability to protect critical infrastructure from cyber security threats and ultimately secure the world from nuclear war. Furthering these science-driven solutions to address our most technological challenges will prove to lift the country up through the establishment of new innovative companies, reduced energy prices, and increased climate resilience. Early breakthroughs and commercial successes facilitated by DOE's national labs can be attributed to the interdisciplinary structure of the labs, their ability to interact with multi-partners, and their ability to scale technologies for national security needs through internal and external partnerships. This is not new for DOE.

DOE Technology Transfer and Commercialization

The DOE and its national labs collaborate on science and technology that will benefit humanity. This has been the case since the beginning with Ernest Lawrence, the first laboratory director of Lawrence Berkeley National Laboratory, who structured his research around interdisciplinary collaborative science. Whether it was his legendary work with J. Robert Oppenheimer, or Lawrence's work to fund the development of the world's first cyclotron, he worked through collaboration on scientific problems. R&D conducted by DOE and its predecessors have had strong collaborative ties among scientists and with outside philanthropic and private sector partners.

Collaboration is important because it is the key to technology transfer and commercialization. Technology transfer, defined in 2011 by former DOE Secretary Steven Chu is "the process by which knowledge, intellectual property or capabilities developed at the DOE's national laboratories, single-purpose research facilities, plants, and other facilities are transferred to other entities, including private industry, academia, state or local governments."[3] When DOE established the Office of Technology Transitions in 2015, it examined the office's role within the Department, it came up with a wider remit for its efforts. The statutory DOE Technology Transfer Execution Plan released in 2016 states, "The OTT has been established not to simply guide singular acts of technology transfer, but rather to foster multiple handoffs between scientists and innovators and investors that make up the dynamic process of technology transitions and nurture the Nation's innovation ecosystem."[4] The "handoffs" and the "dynamic process" occurs through collaboration of a diversity of players, both inside and outside the government.

Overtime, the flexibility, structures, and incentives at DOE that lead to historic collaborations have changed, some through legislation, others through norms and practices codified in DOE orders and directives. The passage of the Stevenson-Wydler Technology Innovation Act of 1980, was one of the first actions taken by Congress to legislate that new discoveries and advances in science should be transferred and utilized to nonfederal entities for societal goals. This act, followed by more than a dozen other laws and executive orders govern technology transfer and commercialization of all federally funded R&D and often creates incentives for increased collaboration. In addition, Congress has shown a

[3] *Secretarial Policy Statement on Technology Transfer at DOE Facilities*, The Honorable Steven Chu, Secretary, Department of Energy, 2011 http://energy.gov/sites/prod/files/gcprod/documents/Policy_Statement_on_TT.pdf.
[4] Technology Transfer Execution Plan, Office of Technology Transitions, Department of Energy, 2016 https://www.energy.gov/sites/prod/files/2016/10/f33/TTEP%20Final.pdf.

particular interest in these activities at DOE with addition authorities provided in the Energy Policy Act of 2005, and most recently in the Department of Energy Research and Innovation Act of 2018, led by the actions of this Committee[5]. These laws authorize multiple collaboration pathways for the transfer and use of DOE funded R&D through minimal tweaks to mostly existing policies and programs.

While it appears this strong interest from Congress would make this a priority for DOE, the actions of DOE and multiple reports over the last few decades demonstrate otherwise. Institutional barriers, misaligned structures, and weak incentives for federally funded researchers lead to significant commercialization shortfalls and hinder the United States from leading the global clean energy transition.[6]

DOE has been whipsawed and hamstrung by political forces beyond its control, making it more risk-averse and cumbersome than most other agencies. The Secretary of Energy Advisory Board found in a 2015 study:

> The lack of consistent and sustained expectations by the DOE for engagement with industry by the laboratories has driven inconsistent focus on industry engagement by laboratory management. Many laboratory directors noted the cyclical nature of DOE expectations regarding industry engagement and the uncertainty regarding industry engagement as part of the DOE mission.[7]

This inconsistency, which has gone on for decades, has created a risk-averse environment within the national labs and the department. Decision-makers sometimes choose to take no action on technology transfer, even when mandated by Congress, because they fear the political winds might change at any time.[8] The popular Technology Commercialization Fund, for instance, was mandated by Congress in 2005, but not set up for another 10 years.[9]

That said, DOE has been going through a process of reform, and Congress, specifically this committee, has been one of the instigators in this process. Some would argue that in 2005 Congress helped kick this process off with the statutory creation of a Technology Transfer Coordinator and the creation of the TCF. One could also argue that Congress' creation of ARPA-E in 2007 was also a way to reform DOE. Further evolutions in the way DOE conducts research include the establishment of energy frontier research centers in 2009, and the creation of innovation hubs in 2010. Most recently the Office of

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[5] Federal Lab Consortium, "Federal Technology Transfer Legislation and Policy: The Green Book" (Federal Lab Consortium, 2018), https://www.federallabs.org/download/file/fid/34317.

[6] Secretary of Energy Advisory Board, "Interim Report," 28; Stepp et al., "Turning the Page;" U.S. Department of Energy Office of Inspector General, "Audit Report: Technology Transfer and Commercialization Efforts at the Department of Energy's National Laboratories (Washington, D.C.: DOE, 2014), 2; U.S. Government Accountability Office, "Clearer Priorities and Greater Use of Innovative Approaches Could Increase the Effectiveness of Energy Laboratories," (Washington, D.C. GAO, 2009), 1.

[7] Secretary of Energy Advisory Board, "Interim Report of the Task Force on DOE National Labs," (Washington, D.C., SEAB, June 2015), 29, https://www.energy.gov/seab/downloads/interim-report-task-force-doe-national-laboratories.

[8] IHS Markit and Energy Futures Initiative, Advancing the Landscape of Clean Energy Innovation, February 2019, 134, https://www.b-t.energy/reports/advancing-the-landscape/.

[9] Commission to Review the Effectiveness of the National Energy Laboratories (CRENEL), Securing America's Future, 2015, 62, https://www.energy.gov/labcommission/downloads/final-report-commission-review-effectiveness-national-energy-laboratories.

Technology Transitions in 2015 was established to implement the vision behind the Technology Transfer Coordinator and the Technology Commercialization Fund. The efforts of the previous administration, and the efforts of the current administration to improve OTT and build it into an integral part of the department can be enhanced and strengthen by the two pieces of legislation we will discuss today.

Additional Efforts are Still Needed

While significant, the current activities of DOE and OTT, in particular, do not negate the overwhelming cultural and programmatic bias of the agency toward early-stage discovery science. Areas for improvement were outlined in the first Technology Transfer Execution Plan released in October of 2016. This plan outlined two critical goals for technology transition efforts of the department. The two goals included:

> Goal 1: Increase the commercial impact of DOE investments through the transition of national laboratory-developed technologies into the private sector.
>
> Goal 2: Increase the commercial impact of DOE investments through private sector utilization of national laboratory facilities and expertise.

Since then, DOE has launch programs with these two goals in mind. Yet, some of the objectives and key activities, also outlined in the report, have yet to be realized. I will examine the two bills for discussion with these goals and the following three additional elements, in mind.

Resource and Prioritize

If Congress wants to increase technology transfer and commercialization at the Department of Energy it needs to resource and prioritize it. When DOE launched OTT and asked the national labs how it could improve technology transitions, it heard very clearly that technology transfer and commercialization are not a high priority for most of the labs and if DOE wanted to see the labs assist in the commercialization of new technology then DOE would need to provide funds for those activities. All DOE lab activities must be billed to a specific budget line. DOE labs currently fund technology transfer out of their indirect budget lines. This means that the statutory technology transfer offices of each laboratory are competing with other items in the indirect budgets of the lab, that includes security and some infrastructure improvements, among other things. Congress needs to fund technology transfer activities that are not accounted for through the indirect budgets of the laboratories.

Furthermore, DOE uses Performance Evaluation and Measurement Plans (PEMPs) to achieve specific outcomes, but they often lack specific commercialization outcomes and inadvertently discourage technology transfer.[10] To help prioritize technology transfer at the labs this process needs to more effectively include these activities as a primary mission of each national laboratory. Congress needs to further instruct DOE to prioritize these activities in laboratory and individual scientist's performance plans.

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[10] Matthew Stepp et al., "Turning the Page: Reimagining the National Labs in the 21st Century Innovation Economy" (ITIF, Center for American Progress, and Heritage Foundation, 2013), 48, https://itif.org/publications/2013/06/19/turning-page-reimagining-national-labs-21st-century-innovation-economy.

Demand or "User" Pull Through the Full Innovation Process

The road from basic research to the market for new products and services is often long, complicated, and beset by significant barriers. A model of the innovation process set out by the President's Council of Advisors on Science and Technology describes four interrelated stages: invention, translation, adoption, and diffusion. Programs and policies across these stages shape a complicated innovation ecosystem that includes a diverse network of institutions. Few technologies move from research to market in a linear fashion. Most are aided by feedbacks from later stages to earlier ones, so that downstream learning is incorporated into design and development.[11]

When these feedback loops break down and the major players are disconnected, promising technologies fall into the valley of death. The Energy Futures Initiative (EFI) and IHS Markit report on energy innovation released last year notes that success in crossing the valley of death "requires the alignment of many players," who bring different skills, experiences, knowledge, and resources to the innovation process.[12]

Unfortunately, most laboratory and academic researchers do not have the tools or the skill sets to bring their ideas to commercialization. Furthermore, DOE's "supply-push" mentality does not enable engagement with the private sector, which is needed to commercialize new technology. When research is informed by private sector demands, the private sector will be more interested and willing to bring new technologies to the market. In short, the players in the United States are often not aligned and DOE's bureaucratic and largely basic science focused infrastructure does not have effective nor systematic ways to incorporate the feedback loops from the myriad of private sector players needed to take technologies to the market.

Pilot, Evaluate, and Scale Good Ideas

Given that DOE is risk-averse it should be funded to experiment with new pathways to commercialization. The Secretary of Energy Advisory Board's (SEAB) National Laboratory Task Force made several suggestions on programs to pilot. Some of these recommendations, such as the development of a fast-track Cooperative and Research and Development Agreement (CRADA) have been experimented with by different labs. Yet, while DOE has made significant strides in recent years to pilot programs and better fulfill its commercialization mandate through these pilots, it lacks the data to demonstrate if these activities have been successful in facilitating either of the stated goals from the TTEP. Furthermore, since there is little data on these programs it is difficult to know whether these programs should be scaled.

The federal agencies, including DOE, collect and report technology transfer activities to Congress on a regular basis. Examinations of technology transfer at DOE have repeatedly found that the department lacks a strategic approach, metrics and evaluation criteria, and appropriate policies to improve its performance in commercializing new technologies. A 2015 report by the Secretary of Energy Advisory Board estimated "that universities create 5 to 8 times more start-up companies on a research-adjusted

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[11] Executive Office of the President, President's Council of Advisors on Science and Technology (PCAST), Report to the President on Accelerating the Pace of Change in Energy Technologies Through an Integrated Federal Energy Policy (Washington, D.C.: The White House, November 2010), 4, https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/pcast-energy-tech-report.pdf.

[12] IHS Markit and Energy Futures Initiative, Advancing the Landscape of Clean Energy Innovation, February 2019, 37, https://www.b-t.energy/reports/advancing-the-landscape/.

basis than the DOE national laboratories." Unfortunately, DOE lacks the granular data needed to understand and improve the impact of individual programs or individual laboratories to facilitate the creation of more start-ups.

DOE needs to institute a policy of piloting, evaluating, and then scaling innovative ideas. Rigorous evaluation over an extended period is required because, as we know from the innovation process, commercialization may take several years. Only two of the programs initiated by DOE have had a third-party and peer reviewed evaluation of their impact: Energy I-Corps and Small Business Vouchers (discussed below).

Energizing Technology Transfer Act

With the two goals from the TTEP and the three high-level elements above in mind, I commend the Committee for the balanced and thoughtful programs and policies identified in the Energizing Technology Transfer Act discussion draft. It authorizes several programs that DOE has piloted and provides important direction and funding for those programs to be successful in facilitating the commercialization of new technology.

Energy I-Corps and Other Demand-Pull Programs (Goal 1)

The bill authorizes several programs that will incorporate more demand pull into the R&D activities of DOE and its labs. The Department's Energy I-Corps program trains national lab researchers to become entrepreneurs, providing them the tools to engage and understand potential customers and perhaps spinout federally-funded technology to the market (goal 1). It has been evaluated by a third-party which found the program to be moving the labs in the right direction. For example, 95 percent of Energy I-Corps participants reported a better understanding of their technologies' value proposition and could identify key market decision-makers after completing the program. Additionally, 80 percent reported being likely to apply the learnings from the program to similar activities.[13] This program was created to increase the demand pull on technology developed by the national labs. Other programs in the discussion draft such as the Lab-Embedded Entrepreneurship Program, Regional Clean Energy Innovation Partnerships, and the National Clean Energy Incubator Program have strong ties to understanding the market and identifying partners that can inform technology development and customers that help facilitate the commercialization of new technology.

Small Business Vouchers and Lab Partnering Service (Goal 2)

Programs in the bill that focus on facilitating access to facilities and expertise (goal 2) of the DOE and its labs such as the Lab Partnering Service and the Small Buisness Voucher program will provide important opportunities for collaboration. SBV was a pilot program started in EERE which provided small businesses access to DOE national lab capabilities and was structured to make lab business practices more compatible with private-sector timelines. A third-party evaluation of the pilot found that 81 percent of awardees advanced at least one level on the technology readiness level scale compared with 43 percent of nonparticipants. Almost half of all awardees received follow-on funding, and 18 percent achieved sales of their SBV-related technology. Ninety-one percent of awardees rated positively how

[13] Gretchen Jordan and Albert Link, Second-year Evaluation of the U.S. Department of Energy I-Corps Program (Washington, D.C.: U.S. Department of Energy, March 2018), https://www.energy.gov/sites/prod/files/2018/12/f58/impact-eval-energy-icorp-03-2018.pdf.

quickly they were able to sign contracts with a national lab—a key goal of the pilot. The evaluation also found the pilot's central application portal was a key to its success, consolidating descriptions of lab resources and capabilities, simplifying the application process, and linking to the labs' standardized contracting mechanisms. This program has been transferred to the Office of Technology Transitions (OTT) and should be funded under one budget line to reduce overly complicated and restrictive technology silos of the department.[14]

The measures provided by the third-party evaluator demonstrate the value of SBV, the same can not be said about the Lab Partnering Service. This service was started by my team at OTT, and while we had strong interest in the tool from some labs and outside stakeholders, it is unclear what value it is providing these stakeholders. The bill requires an evaluation at three years, which seems appropriate. If the evaluation proves the tool to be unsuccessful in achieving its stated goals, it would be important for there to be a back-stop in the bill directing DOE to terminate or transitioned the tool to an entity outside of DOE that is more appropriate for managing and maintaining such a tool.

Technology Commercialization Fund

The new language for the Technology Commercialization Fund (TCF) mostly mirrors how the program is currently implemented by DOE. The original program had specific private sector matching requirements which the draft removes. Removing the matching requirement could be appropriate for early-stage technology from a national lab, but also removing the requirement for private sector engagement should be reconsidered. I encourage the committee to examine this language and ensure it brings in private sector partners to inform the development of lab technology and create the demand pull to enable commercialization.

Additionally, the draft bill does not fix one of the most vexing issues with the TCF. The TCF is created by cobbling together 0.9 percent of the applied energy R&D budgets of the department. That means that 0.9 percent of the solar, wind, water, fuel cell, etc. budgets are included in the TCF, but that does not mean the funds become one stream of funding. Instead, each 0.9 percent of a program office budget must still be used for the original technology it was appropriated for by Congress. This is often called the "color of money" issue. That means instead of having one $30 million fund every year, DOE implements a complicated, slow, and restrictive process for several budget lines to identify promising energy technologies for commercialization from the DOE labs. I recommend that the Committee amend the language to require that one fund be created with no restrictions to the kind of energy technologies the funds should be used to help commercialize.

Furthermore, it is not clear that the TCF has achieved its objective to facilitate the commercialization of new energy technology. It does not appear that DOE has evaluated the program. No data exists for the public to examine its performance and understand the value this program may be providing the labs or the country.

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[14] Gretchen Jordan and Albert Link, Evaluation of U.S. DOE Small Business Vouchers Pilot (Washington, D.C.: DOE, November 2018), 37, https://www.energy.gov/sites/prod/files/2018/12/f58/eval-small-business-vouchers-pilot-112718.pdf. Gretchen Jordan and Albert Link, Second-year Evaluation of the U.S. Department of Energy I-Corps Program, (Washington, D.C.: U.S. Department of Energy, March 2018), https://www.energy.gov/sites/prod/files/2018/12/f58/impact-eval-energy-icorp-03-2018.pdf.

Resource and Prioritize

Finally, the discussion draft provides significant funds for many important commercialization programs. These funds will help support the under-resourced technology transfer offices at DOE labs, and will provide a cash infusion into struggling incubators and regional energy innovation intiatives. Non-profits, economic development organizations, and even universities, do not have the resources to assist in the commercialization of new technologies. Since these activities are often funded through indirect budgets or are an afterthought to R&D projects, in lean times when budgets are severally stressed, as we are seeing now with COVID-19, technology transfer and commercialization activities are the first things to be cut.

Additionally, the discussion draft creates a technology transitions program, to be implemented by the Technology Transfer Coordinator, or the Director of the Office of Technology Transitions. This section secures OTT's budget to conduct program activities, this is a clear message to DOE and the rest of Congress that OTT is a part of DOE's mission and not an administrative function to be funded out of overhead. This committee working with the appropriators should direct DOE to take OTT's budget line out of Department Administration and give it its own budget line.

The programs and policies of the discussion draft are admirable, and continued efforts should be made to develop these ideas to reform DOE, but in the highly competitive global innovation ecosystem, this is not enough. Like all federal agencies, DOE is constrained by important, but often complicated and bureaucratic processes that slow innovation.

Increasing & Mobilizing Partnerships to Achieve Commercialization of Technologies for Energy

More must be done to drive R&D from early-stage discovery projects to commercial products with social, environmental, and economic benefits for the country. The bipartisan and bicameral bill, Increasing and Mobilizing Partnerships to Achieve Commercialization of Technologies for Energy Act or IMPACT bill, directs the Secretary of Energy to create a not-for-profit energy foundation for the Department of Energy focused on the commercialization of new energy technology to achieve these benefits. In May of this year, I co-authored with David Hart of the Information Technology (ITIF) and Innovation Foundation a report called, *Mind the Gap: A design for a New Energy Technology Commercialization Foundation*, which lays out a vision, mission, and activities of such a foundation.

Discussions with key DOE and energy stakeholders suggested that decisions about a DOE foundation's organization and operation would have major implications for its effectiveness. Therefore, ITIF's goals for the report were:

1. To develop a better understanding of how a Department of Energy foundation should be organized and operated if it is to have the desired effect of improving and accelerating the commercialization of federally funded energy R&D.
2. To share this understanding with and build support, if appropriate, for it among key stakeholders in a future DOE foundation.

Below is a summary of the vision and design for a DOE foundation, which we call the Energy Technology Commercialization Foundation. It draws on more than 140 interviews and two full-day stakeholder

workshops, as well as extensive research on the diverse array of agency-related foundations Congress has authorized since 1967.

Energy Technology Commercialization Foundation Vision and Overview

A nonprofit Energy Technology Commercialization Foundation (ETCF), authorized by Congress to work closely with the U.S. Department of Energy (DOE), could help fill the valley of death by allowing energy innovators' access to DOE's tremendous technical expertise and world-class facilities, thereby helping them advance more quickly. It would encourage DOE-funded researchers to more aggressively seek commercial applications for their discoveries, and connect them with partners, funding, and tools to do so. These activities would be motivated by national and regional opportunities to develop globally scalable solutions to decarbonization challenges through collaborative partnerships with the private sector.

Within the context of these national and regional collaborative strategies, ETCF would regrant most of its funds, and direct its staff, advisors, and other resources to four commercialization activities. Most recipients of funding and resources, including DOE offices and labs, would:

1. streamline access to facilities and expertise;
2. educate and train researchers to become entrepreneurs;
3. carry out R&D to turn prototypes or other early-stage technologies into marketable products; and
4. convene energy innovation stakeholders.

ETCF would raise most of its funds from private-sector and philanthropic donors that see value in accelerating the commercialization of carbon reducing technologies. Groups of domestic companies seeking a competitive advantage in decarbonizing common activities or supply chains, for instance, would partner through ETCF to build up service providers and next-generation vendors. Mission- and region-oriented philanthropies would give to it to advance their environmental and economic objectives.

ETCF would regrant these funds to innovative teams and organizations developing new energy technologies in a variety of settings, including businesses, incubators, universities, and government laboratories. ETCF would leverage its strong connection to DOE to connect innovators with technical resources and expertise across the country, including DOE's 17 national laboratories and extensive network in academia and the private sector. ETCF's congressional authorization as envisioned in the ITIF report would allow it to catalyze technical collaborations more effectively than other nongovernmental entities. ETCF would complement and supplement DOE's own activities, doing what DOE is constrained by existing rules from doing or has proven unable to do with great success and speed.

ETCF would help DOE and energy innovation organizations respond more rapidly and effectively to cross-cutting challenges by convening private and philanthropic partners, developing strategies, and catalyzing collaborations focused on commercialization. These efforts would be driven by private-sector opportunities, and informed by DOE's depth of knowledge and expertise. They would cut-across several federal agencies, multiple units within DOE, and many state and local governments, along with a diverse array of private-sector interests. This will help overcome some of DOE's organizational and structural challenges with siloed funding, and management practices, while not duplicating DOE's activities and leveraging its expertise.

The ETCF's authorization would draw on precedents set by other congressionally authorized agency-related foundations, such as the National Park Foundation (NPF), the Foundation for the National Institutes of Health (FNIH), the Foundation for Food and Agriculture Research (FFAR), and the Centers for Disease Control Foundation (CDCF). These precedents include the capacity to create public-private partnerships in ways that federal agencies cannot, and the ability to transfer money and equipment to agencies. They can also take action more quickly and flexibly than agencies can, as exemplified by CDCF's ability to raise over $110 million to respond to COVID-19 so far in 2020.[15]

A 2019 Congressional Research Service report articulates several potential benefits of agency-related foundations for fostering public-private R&D collaborations:

1. providing a flexible and efficient mechanism for establishing public-private R&D partnerships;
2. enabling the solicitation, acceptance, and use of private donations to supplement work performed with federal R&D funds;
3. increasing technology transfer and the commercialization of federally funded R&D;
4. improving the ability of federal agencies to attract and retain scientific talent; and
5. enhancing public education and awareness regarding the role and value of federal R&D.

If the United States is to lead the world toward a cleaner energy future and gain the economic, security, and environmental benefits of that leadership, it must fill the gaps in its system for commercializing new energy technologies by better connecting the diverse players that make up the energy innovation ecosystem. Building on the flexible, challenge-oriented, and partnership-based precedents set by the diverse and growing network of federal agency-related foundations, a new DOE-related foundation should be set up with this aim. The report proposes this ETCF be charged by Congress with the mission of supporting DOE by strengthening U.S. competitiveness in a carbon-constrained world and appropriated $30 million to establish the foundation and an additional $3 million annually for administrative and operational expenses.

Opportunities to Strengthen IMPACT Bill

The IMPACT bill provides a strong framework to establish the Energy Technology Commercialization Foundation. It rightly identifies the foundation's central role to facilitate public-private partnerships to commercialize research and technology by bringing together the diversity of partners to create a pathway to commercialization for energy technologies. It also is laser focused on the valley of death and the activities needed to help bridge that gap including competitions, fellowships and grants, programs to support the numerous interactions required throughout the innovation process. Furthermore, the bill includes several critical authorities for the foundation to have the flexibility of a not-for-profit, as well as, provide administrative services to assist DOE.

To strengthen the bill, I suggest stronger language on how it will collaborate with the DOE and its labs and how a clearer strategy on how the foundation will support public-private collaborations.

<u>Foundation Collaboration with DOE and the Labs</u>

ETCF's governance structure must establish a clear mission, ensure the foundation is responsive to the public interest, and delineate a complementary and nonoverlapping relationship with DOE. As with

[15] Centers for Disease Control Foundation. Making an Impact: the CDC Foundation Responds to COVID-19. Accessed on July, 10, 2020. https://www.cdcfoundation.org/sites/default/files/files/COVIDresponseupdate9-2.15PM.pdf

other agency-related foundations, ETCF's authorization must provide minimum requirements for the composition of a diverse governing board, including membership for the senior leadership of DOE, and conflict of interest and ethics policies. Importantly, the authorization needs to create appropriate processes for streamlining contracting and administrative requirements between ETCF and the DOE that hamper DOE's technology commercialization efforts today.

Equally important for the bill are specific requirements for DOE to collaborate and coordinate with ETCF. Beyond the relationships established by board membership, the bill should also mandate internal DOE guidance, directives, and orders pertaining to an effective relationship with the ETCF. These official documents should be developed in partnership with ETCF and take into consideration concerns of all stakeholders, including the national laboratories. All guidance documents should be binding on all DOE units, including the National Nuclear Security Administration, ARPA-E, and other semiautonomous agencies within DOE. All DOE national laboratories, sites, and facilities should be allowed and encouraged to work with ETCF. The requirements on DOE to work with the foundation will help DOE prioritize and resource the relationship, which in turn will help enhance commercialization.

Strategy to Support Public-Private Partnerships

The authorization should also outline the main strategies, activities, and programs of the foundation. At the core of our design for ETCF are two strategies aimed at catalyzing and incubating collaborations between the public, private, and philanthropic communities to accelerate the commercialization of energy technology in the United States. An ETCF would:

1. respond to cross-cutting national challenges; and
2. strengthen regional energy innovation ecosystems.

These strategies build on distinctive attributes of existing agency-related foundations such as FNIH and FFAR that are particularly relevant to the energy industry and ETCF's transformative mission. The objective of the collaborations is to create partnerships that allow for the free flow of information across the valley of death, aligning the different players of the innovation process and reducing risk. This creates the demand or "user" pull needed to commercialize new technology. The bill should require the ETCF to submit a strategic plan to guide its initial activities, which would be updated after the first two years and then every five years after that. It should include strategies, such as the ones identified in the ITIF report, but it should also provide the foundation the flexibility to adjust these strategies to important technological advancements and societal needs.

Accountability and Evaluation

Finally, while the foundation will be a non-for-profit private organization, it is still created by Congress and should be appropriately accountable. The authorization should include annual reports and financial audits. All of these documents are standard for highly-effective non-profit organizations and parallel the requirements set forth by Congress for the other agency-affiliated foundations.

As discussed earlier, commercialization outcomes take a very long time, include multiple players, are not linear, and are often difficult to attribute to one specific action. Nonetheless, measurable goals that indicate whether these outcomes are likely to be achieved can and should be developed, and ETCF held to them. ETCF would work with experts on research evaluation to develop qualitative and quantitative metrics for the organization as a whole as well as its main activities and strategies. The bill should

require ETCF to incorporate and fund evaluation for projects and grants from the beginning, and periodically fund third parties to evaluate and provide feedback that informs program development.

Conclusion

There are many pathways that could lead to radical reductions in carbon emissions, all of them will be disruptive to major industries and require significant deployment of new technology, ranging from electric power to transportation to agriculture, not to mention fuels, chemicals, and materials. Yet, there are gaps in the energy innovation ecosystem and barriers to technology commercialization slowing down the transition of these industries. In IEA's 2019 report, "Tracking Clean Energy Progress (TCEP)," it found that 40 of 46 energy technologies are not on targeted to facilitate the world's ability to stay well below two degrees of global temperature rise by 2050.[16]

Furthermore, as may already be observed in sectors such as coal mining and solar panel manufacturing, the energy transition will create winners and losers across communities, companies, and countries. A country that strengthens its competitiveness is likely to weather the coming disruption better than one that fails to make the most of emerging opportunities. Yet, the country's response to COVID-19 demonstrates weaknesses in our ability to respond to science-based grand challenges.

The United States has much to contribute to the innovations that will power the energy transition and reduce the impact of the climate crises—and much to gain from them as well. The Energizing Technology Transfer Act does much to reform and improve DOE's ability to both originate and assist in the development of new technologies for this transition. The IMPACT bill, which creates a DOE foundation, would be a valuable mechanism for both enhancing the contributions the nation makes to this critical global effort and ensuring it receives a reasonable share of the economic gains from it.

[16] IEA. Tracking Clean Energy Progress. https://www.iea.org/topics/tracking-clean-energy-progress (2019).

Ms. Jetta Wong Short Biography:

Jetta Wong is President of JLW Advising and Senior Fellow in the Clean Energy Innovation Program at ITIF. In her consulting practice, she advises clients on how to bring new clean energy technologies to the market. Previously, she worked at the Department of Energy, joining in July of 2012. Before joining the Department of Energy Jetta worked for the United States House of Representatives' Committee on Science, Space, and Technology. She worked on a wide range of energy and environment policy issues related to civilian research, development and demonstration programs at the Department of Energy and the Environmental Protection Agency.

Before working for Congress, Jetta worked for the Clean Energy Program of the Union of Concerned Scientists (UCS) where she brought stakeholders together from southern states in support of clean energy policy. Prior to her work at UCS she served as the Senior Policy Associate on Sustainable Biomass for the Environmental and Energy Study Institute (EESI). There she testified twice for Congress on bioenergy and worked with congressional staffers and stakeholders to develop policies that promote cutting edge sustainable renewable energy technologies. Jetta's career in energy started in Uzbekistan where she was a natural resources consultant on an anaerobic digestion development project. Jetta holds a MPS in Legislative Affairs from George Washington University and B.S. in Natural Resources and the Environment from the University of Michigan.

Chairwoman FLETCHER. Thank you, Ms. Wong. Ms. States.

TESTIMONY OF MS. JENNIFER STATES,
DIRECTOR FOR BLUE ECONOMY, DNV GL,
AND PROJECT DIRECTOR, WASHINGTON MARITIME BLUE

Ms. STATES. Thank you to Chairman Lucas, Chairwoman Fletcher, Ranking Member Weber, and Members of this Subcommittee, for giving me the opportunity to testify today.

As the Director for Blue Economy at DNV GL, I serve as a conduit within our globally diverse company for crosscutting activities in the energy and maritime sectors in North America. I also serve as Project Director for Washington Maritime Blue, the newly formed cluster organization that is a partnership between public, private, community organizations, and research institutions working in collaboration to implement maritime clean energy and join innovation projects as part of Washington State's strategy for the blue economy. Together, we find solutions that create economic growth, healthy ecosystems, and thriving communities.

In my 20 years of renewable energy and cleantech experience, I have had the opportunity to cross over into industry, nonprofit, government, and research environments. This includes work at PNNL within Department of Energy's technology offices and economic development at a port authority. This has crystallized my understanding of how crosscutting collaboration is key to accelerating clean energy innovation, but we need new funding models that can build the foundations to enable collaboration and increase the pace of innovation and commercialization faster than we are able to achieve within our own individual silos.

Our world has changed in the blink of an eye. The COVID–19 crisis has demonstrated the need for rapid response and collaboration across diverse entities. Critical new research innovations and developments are being fast-tracked to hasten the medical and economic response, but no one government entity has been able to act fast enough or on its own to address the rapidly evolving situations. Partnerships are critical for deploying the necessary support.

We are facing a critical need and opportunity to accelerate the commercialization of clean energy technologies. We need to embrace this opportunity both for economic and environmental reasons to reduce emissions, as well as create well-paying clean-energy jobs to propel the United States from our current economic crisis.

From global to local regulations, DNV GL's clients are dealing with an unprecedented need to innovate and meet requirements to stay competitive. For example, the International Maritime Organization has set ambitious CO_2 emission reductions that the shipping industry is currently not on target to meet. We must accelerate the availability of clean energy infrastructure at our ports and promote vessel uptake of new technologies such as batteries and alternative fuels.

In Norway, I've seen the industry and government alike calling for stricter regulations because they know their deep investments in new technologies are giving them a competitive edge in global markets. If the United States is to compete, we need to leverage our collective assets more effectively and target investments into meeting our crosscutting clean energy challenges.

The bills before you today offer several potential solutions, but I want to highlight the creation of the Department of Energy foundation as proposed in the *IMPACT for Energy Act* and the regional clean innovation partnerships, as proposed in the *Energizing Technology Transfer Act*. The regional partnerships create key public support for activities, which is critical for enabling public—excuse me, private participation and leveraging of private resources.

The IMPACT for Energy foundation's purpose aligns with that of Washington Maritime Blue, by fostering collaborations and partnerships with different entities, leveraging technologies for new product development, and supporting regional economic development. Maritime Blue has demonstrated this model can work, but a state-based effort can only do so much. We need to tap into a broader pool of expertise, facilities, and funding to be able to implement and advance these innovations. The formation of the foundation is essential for creating this enabling environment for crosscutting collaboration.

We have an example within Maritime Blue that is a crosscutting collaboration for a 1-megawatt mobile shore power hydrogen system for Tacoma Power that would demonstrate the potential of formic acid as a liquid hydrogen carrier, but we have—and, fortunately, the Department of Energy had a funding opportunity for hydrogen at ports, but we have run into many difficulties in trying to implement this project that is so crosscutting, bringing all the entities together, and dealing with several of the bureaucratic barriers faced by private companies, especially small private companies that are just starting to scale, including OCO, Inc., our partner on this project.

A new model is needed to bring industry to the table in a way that allows us to work together to accelerate the necessary innovations and create new green jobs. The proposed bills provide opportunities to achieve collaboration and the timing and need to come together and solve our economic and environmental challenges could not be more critical. Thank you.

[The prepared statement of Ms. States follows:]

DNV·GL

Testimony of Jennifer States

Director for Blue Economy, DNV GL Energy and Maritime North America

Project Director, Washington Maritime Blue

Submitted to the

U.S. House of Representatives,

Committee on Science, Space and Technology,

Subcommittee on Energy

Hearing on

From Lab to Market: Accelerating our Progress

Toward Economic Recovery and a Clean Energy Future

July 17, 2020

DNV·GL

DNV GL Energy USA, Inc.
1400 Ravello Drive, Katy, TX 77449
www.dnvgl.com

Washington Maritime Blue
3303 Monte Villa Parkway, Suite 340
Bothell, WA 98021
www.maritimeblue.org

Testimony of Jennifer States
Director for Blue Economy, DNV GL Energy and Maritime North America
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Submitted to the House Committee on Science, Space and Technology
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As the Director for Blue Economy at DNV GL, I serve as a conduit within our globally diverse company for cross-cutting activities in the Energy and Maritime sectors. I also serve as Project Director for Washington Maritime Blue, the newly formed cluster organization that is a non-profit partnership between public entities, private industry, community organizations, and research institutions to find solutions that create economic growth, healthy ecosystems and thriving communities. We are working in collaboration across different sectors and entities to implement maritime clean energy and joint innovation projects that are part of Washington State's strategy for the Blue Economy[1].

DNV GL is the independent expert in risk management and quality assurance, driven by **OUR PURPOSE**: To safeguard life, property and the environment; and **OUR VISION:** A trusted voice to tackle global transformations. We provide independent and unbiased classification, technical assurance, software and expert advisory services to energy, maritime and oil and gas, industries. We also provide certification and supply chain services to customers across a wide range of industries such as health care, food and beverage.[2]

DNV GL has operated in the United States for 122 years, since 1898. Globally, we have 12,000 employees in more than 100 countries, 2,000 of whom work the USA in 39 offices across 22 states. DNV GL USA is headquartered in Katy, Texas, with major offices in Ohio, California, Pennsylvania, Illinois, Michigan and Oregon, to name a few. Our

[1] *Washington State's Strategy for the Blue Economy*, Washington State Department of Commerce & DNV GL (2019). www.maritimeblue.org

[2] DNV GL is the second-leading independent accreditor of hospitals in the United States, recognized by the Centers for Medicare and Medicaid; a leading certification body for medical devices in the global market, recognized by the US Food and Drug Administration; and a liaison representative to the Healthcare Infection Control Practices Advisory Committee, providing advice to the Centers for Disease Control and Prevention.

experts are dedicated to helping customers make the world safer, smarter and greener, and generated in 2019 revenue of $400 million in the USA and $2.45 billion worldwide[3].

DNV GL fosters customer-centered innovation in its businesses through a formal investment program. Each business unit reserves up to 5 percent of its annual revenue for use on innovation projects focused on creating greater value for our customers. Working closely with our customers, DNV GL has developed a broad range of data sources, analytic tools, and service delivery capabilities which we continue to use and refine to meet evolving customer and market needs.

DNV GL has been actively involved in business collaborations and publications for energy transitions and innovation acceleration. Some examples include our annual Energy Transition and Maritime Outlook reports and work on maritime energy transition strategies and cluster implementation through joint innovation. We have forthcoming publications and events specifically focused on North American Ports as Clean Energy Gateways, which will be released on July 22nd as part of a complementary webinar. Globally, our *Ports as Green Gateways* report was released on July 2, 2020 with partner Eurolectric. Our recently released report for the UN Global Compact, which explored how, with only ten years to reach the sustainable development goals, requires companies need to move from decades of ambition to The Decade of Action, and brought together more than 10,000 companies and 4,000 non-business entities.[4]

Washington Maritime Blue is a Cluster organization charged with implementing the State's strategy for the blue economy. Maritime Blue is a non-profit partnership between public entities, private industry, community organizations and research institutions. Through joint innovation projects, incubator and accelerator programs, workforce development programs, and much more they cultivate collaboration as a key factor for the triple bottom line values of the blue economy: economic growth, healthy ecosystems, and thriving communities. DNV GL has been working with Maritime Blue since its initial conception to foster creativity across entities and find ways to take innovative ideas from drawing board to implementation.

In my 20 years of renewable energy and clean tech experience, I've had the opportunity to cross over into industry, non-profit, government and research environments. In addition to DNV GL, this includes work at Pacific Northwest National Laboratory, working within the Department of Energy's Wind and Waterpower Program Office, economic development at a Port Authority, managing a wind energy development company, and serving as an elected City Councillor in Sequim, WA. Working in these public and private organizational environments has exposed me to the different perspectives and capabilities each can bring to the table, as well as the different pace and ways of conducting operations. It has crystalized my understanding of how collaboration across

[3] *DNV GL Annual Report for 2019.* https://annualreport.dnvgl.com/2019

[4] UN Global Compact 20th Anniversary Report, *Uniting Business in the Decade of Action*. https://www.dnvgl.com/publications/UNGC-Report/decade-of-action.html

different sectors and silos is key to accelerating clean energy innovation. But we need new models that can build the foundations to enable collaboration and increase the pace of innovation and commercialization faster than we are able to achieve in our individual silos.

Our world has changed in the blink of an eye. The COVID-19 crisis has demonstrated the need for rapid response and collaboration across diverse entities. Critical new research, innovations and deployments are being fast-tracked to hasten the medical and economic response. But no one government entity has been able to act fast enough, or on its own, to address the rapidly evolving situations. Partnerships are critical for deploying the necessary research, innovation, commercialization, manufacturing and logistical support.

We are facing an incredible opportunity and critical need to accelerate the commercialization of clean energy technologies. We need to embrace this opportunity for economic and environmental reasons: to reduce emissions for the environment, as well as to create well-paying clean energy jobs to propel the U.S. from the economic crisis we face. From global to local regulations, DNV GL's clients are dealing with an unprecedented need to innovate and adapt new technologies to meet requirements and stay competitive. For example, the International Maritime Organization has set ambitious CO_2 emissions reductions that the shipping industry is not currently on target to meet[5]. This was one of the findings from DNV GL's recent *Maritime Forecast to 2050*, part of our Energy Transition Outlook series of annual reports[6]. To meet these targets, we must accelerate the availability of clean energy infrastructure at our ports and promote vessel uptake of new technologies such as batteries and alternative fuels. In Norway, I've seen the industry and government alike calling for stricter regulations, as they know their investments in new technologies will give them a competitive edge in global markets. If the U.S. is to compete, we need to leverage our collective assets more effectively and target investments into meeting our cross-cutting clean energy challenges.

How can we foster an environment that optimizes DOE's support for the acceleration of clean energy innovations to commercialization? I've seen first-hand how an enabling environment and government support can make all the difference in bringing players together to work towards a common vision. The new Washington Maritime Blue Cluster organization has brought diverse players together across the quadruple helix of government, industry, research, and community organizations to first, agree on a common vision for values that focus on competitiveness and sustainability. And second, to work together in an independent, collaborative organization to meet new regulatory, economic, and innovation challenges. Getting ahead of the curve in addressing challenges also means the companies involved can turn challenges into a competitive advantage and growth opportunity for our local industries.

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[5] International Maritime Organization (IMO) April 2018 MEPC 72nd session.

[6] *Maritime Outlook to 2050*, DNV GL. https://eto.dnvgl.com/2019/Maritime/

The bills before you today offer several potential solutions for DOE to enable the right collaborative environments for acceleration of commercialization. I want to specifically highlight the creation of a Department of Energy Foundation as proposed in H.R. 3575, IMPACT for Energy Act, and the Regional Clean Energy Innovation Partnerships as part of the proposed Energizing Technology Transfer Act. The Regional Partnership would create a consortium-based approach to accelerate the pace of innovation with funding for key activities such as planning, stakeholder engagement, networking, as well as applied clean energy projects. Providing the public funding for such activities is critical for enabling private participation and leveraging of private resources. Two fundamental elements of this approach are the ability to identify and use regional competitive strengths and increased responsiveness to regional needs.

The purpose of the IMPACT for Energy Foundation aligns with that of Washington Maritime Blue, by fostering collaboration and partnerships with different entities and leveraging technologies by supporting new product development that supports regional economic development. While the bill does not prescribe how the Foundation should be set up and run, the Mind the Gap report from ITIF provides good guidance on how such a Foundation could be structured. Establishing the right mix of players on the Board will allow for the best path forward to working out these details. The formation of the Foundation is essential for creating the enabling environment for cross sector and cross-entity collaboration. I will explain why this is the case by providing a Maritime Blue demonstration project example and highlighting the key challenges that the private sector faces in working with the DOE.

Our experience with Washington Maritime Blue has demonstrated that a collaborative model that allows for cross-sector engagements can work, but a state-based effort can only do so much.

We need to tap into a much broader pool of expertise, facilities, and funding in order to implement and advance these innovations. One example is our Joint Innovation Project for growing a "Maritime Hydrogen Ecosystem through Formic Acid Storage Pathways." We are working in a public-private consortium to assemble the funding (pending application for H2@Scale) and necessary capabilities for a new demonstration project concept that will deploy a 1 MW mobile shore power Hydrogen system that demonstrates the potential of Formic acid as a Liquid Hydrogen Carrier. This project will:

- Utilize Tacoma Power's off-peak clean energy from hydropower for electrolysis to produce zero-emission Hydrogen.
- Capture Hydrogen and CO2 in the form of Formic Acid, which acts as a Liquid H2 Carrier for safer storage and transport. This technology was initially developed by DNV GL, and was licensed to new commercialization company OCO, Inc[7]. The

[7] DNV GL initiated and developed the reaction technology to electro-catalytically convert CO_2 into formic acid in 2008. In 2015, DNV GL set out to license its technology to a firm dedicated to commercialization and formed OCO, Inc. with Brix-Berg one year later in 2016. https://ocochem.com/about/

Pacific Northwest National Laboratory (PNNL) provides conversion technology for Formic Acid to Hydrogen that can be utilized in a Fuel Cell for power generation.

- This will be deployed as a 1 MW mobile shore power system, truck mounted with two cargo containers, one for the fuel cell and one for the tank storage, which also can enable deployment where needed for energy resiliency. Liquid Hydrogen Carriers also offer the potential for expanding the use of Hydrogen as a fuel for Maritime Shipping.

But there have been numerous challenges in assembling a multi-entity consortium for an integrated project that cuts across the Energy-Maritime-Transportation-Chemical/Fuel industries. Fortunately, DOE has a category that recognized the need for Hydrogen at Ports, but the systematic approach crosses different technology needs and Technology Readiness Levels, which were difficult to align with the opportunity. Maritime Blue was asked to lead the consortium, but the DOE funding opportunity required a private-industry lead, so we had to pivot to the private commercialization company OCO, Inc. The opportunity requirements presented many challenges: a 50% cost share which the private partners had to cover the costs of PNNL's participation, rates that don't allow for profit and restrict overhead, hourly time recording, handling of IP and liability, and many other provisions that don't align with how most industries conduct business. The administrative burdens are often too much to bear for large corporations that do government work, let alone new technology companies.

Speaking as a private industry representative, I have heard many frustrations expressed by my partner companies and colleagues in trying to do business with the Department of Energy. Solicitations are organized by technology office, while many industry demonstrations need to take an interconnected systems approach for the business case to succeed. The bureaucracy of applying for and dealing with Federal opportunities is often described as "not worth the cost of doing business". From hair splitting in designating eligible entities, to required time recording on an hourly basis, to the burdensome reporting requirements and changes in expectations from different staff and offices, I struggle to get colleagues to even respond to RFI's looking to shape funding opportunities directly related to their areas, due to the perceived lack of return on the time invested. A new model is needed to bring industry to the table in a way that allows us to work together to accelerate the necessary innovations and create new green jobs.

As the ITIC "Mind the Gap" report[8] points out: "no one entity in the U.S. energy innovation system is responsible for bringing new technologies across the fabled "valley of death" between proof of concept and early adoption in the market. Government and philanthropic funding typically come too early in the process to help would-be innovators get to market, while the private sector tends to prefer investments that pay off more

[8] *Mind the Gap: A Design for a New Energy Technology Commercialization Foundation*. Jetta L. Wong and David M. Hart, Information Technology & Innovation Foundation (2020). https://itif.org/publications/2020/05/11/mind-gap-design-new-energy-technology-commercialization-foundation

quickly and with more certainty." This gap in the nation's energy innovation system puts our economic recovery and clean energy future at risk.

The proposed IMPACT for Energy Foundation and Energizing Technology Transfer Act offer opportunities to accomplish collaboration for acceleration of innovation. And the timing and need to come together to solve our challenges could not be more critical.

Thank you for your time and consideration. I look forward to discussing these opportunities and addressing your questions.

* * *

Jennifer States

Jennifer is Director for Blue Economy at DNV GL – Energy and Maritime North America. She is the Project Director for Washington Maritime Blue and has been leading Cluster communications, stakeholder engagement, joint innovation projects, as well as strategic planning for the Washington State Department of Commerce. Her current focus areas include maritime innovation and decarbonization projects, with a technical focus on vessel electrification and alternative fuels, as well as shoreside renewable energy, storage and microgrids.

She brings 20 years of renewable energy and clean tech experience in industry, non-profit, government and research environments. Her experience includes work at the Port of Port Angeles, Pacific Northwest National Laboratory, managing a wind development company, as well as serving as City Councilor for the City of Sequim, WA. Her greatest accomplishments include leading stakeholder engagement and strategy development for Washington Maritime Blue, launching a start-up in carbon fiber recycling, the implementation of renewable energy policy (including Section 1603 Payment in Lieu of Tax Credits), and driving development of clean energy projects across the US.

Chairwoman FLETCHER. Thank you, Ms. States. Ms. Benahmed, you're next.

TESTIMONY OF MS. FARAH BENAHMED,
CLIMATE AND ENERGY POLICY ADVISOR, THIRD WAY

Ms. BENAHMED. Ranking Member Lucas, Chairwoman Fletcher, Ranking Member Weber, and Members of the Committee, thank you for the opportunity to testify today. I'm honored to speak before you at a time when our Nation faces enormous challenges and needs equally great solutions.

I would like to thank the Committee and others in Congress who have supported major policies like the *CARES Act* and the *HEROES Act* in flattening the curve of COVID–19 cases, saving American lives and protecting America's workers and businesses from the economic downturn this pandemic has caused.

While we work to resolve the public health and economic crises, the growing threat of climate change has not gone away. How we choose to rebuild will determine not only the speed and scale of our economic recovery but also our ability to reach net zero emissions by midcentury. With the enormous economic opportunity in the clean energy transition, other countries are racing to establish themselves as market leaders for our emerging clean energy technologies. As a long-standing world leader in innovation, the United States has the institutions, resources, and capabilities to reap a major share of the benefits as an inventor and exporter of clean energy technologies. Simultaneously, these investments will create jobs, buildup small businesses, and make the U.S. economy more resilient.

There are number of ways the Federal Government could advance clean energy innovation. My testimony will focus on the following policy goals: emergency relief for clean energy startups, increasing investment in clean energy innovation, committing to clean energy demonstrations, and establishing and scaling technology transfer programs.

First and foremost, COVID–19 has created immense market uncertainty as the pandemic runs rampant across the United States. The pandemic could take many small businesses down, including clean energy startups, without concerted Federal action. As part of its broader emergency measures to stabilize the economy and prevent further job loss, Congress must ensure that an entire generation of early stage innovative companies does not die on the vine. Congress should consider temporarily waiving cost-share requirements, eliminating government payment delays, optimizing the payment protection program, providing no-cost extensions in emergency cash grants, and expanding the small business innovation research program (SBIR).

Second, the United States has been falling short in terms of public energy research and development spending relative to national GDP (Gross Domestic Product) at a time when other countries are competing to capture their share of what is a $40 trillion opportunity. Effectively tackling the economic and climate crises must include at least a doubling of Federal investment in clean energy innovation over the next decade. Funding for the Department of Energy must be increased to match the scale of the climate crisis,

and the structure should be updated to maximize efficient utilization of these resources.

Third, we need to give the innovations we're investing in a greater chance of commercial success. Today, clean energy researchers and entrepreneurs face an innovation gap struggling to secure either private-sector investment or Federal funding for their technology projects, especially in later stages. This valley of death where a lack of Federal funding kills off—or a lack of funding kills off many promising technologies before they can reach their full potential can leave economically viable solutions behind. Accelerating clean energy innovation must include the Federal Government's commitment to clean energy demonstrations. Congress should start by investing in the demonstrations that could quickly receive funding and start making an economic impact in the near future.

Last, DOE and other Federal agencies have a wide range of programs with a proven track record of supporting talented entrepreneurs to create high-quality jobs. As Congress crafts economic stimulus measures, it must ensure that technology transfer programs have the necessary authorizations and appropriations to rebuild a larger, more dynamic startup ecosystem across the United States.

The *Energy Technology Transfer Act* enhances and expands many DOE technology transfer programs, conveying the serious leadership and thoroughness of this Committee to address climate change. I also commend the bill for prioritizing the Office of Technology Transitions and its mission around climate change. Congress should take additional actions to strengthen OTT, most notably by giving the Office its own budget line to enable greater certainty and direction in regards to Federal spending.

Furthermore, scaling the technologies we need to fight climate change will require large-scale efforts beyond the programs at DOE. The bipartisan, bicameral *IMPACT for Energy Acts* aims to establish a nonprofit foundation aligned with DOE's mission with the kind of creative thinking needed to meet the scale of the crisis. Like other successfully Federal—federally authorized foundations, a DOE foundation would increase private investment, public-private collaboration, and access to DOE's resources and facilities.

The challenges of the crisis before us are a massive undertaking. Carrying out energy innovation policies can support struggling businesses and workers now and drive long-term economic growth while also putting the United States on a faster, fairer path to net zero emissions by 2050 at the latest.

Thank you again for the opportunity to testify today and for the Committee's efforts on key legislation like the ones we're discussing today. I look forward to the continued work in progress on this issue.

[The prepared statement of Ms. Benahmed follows:]

Testimony of Farah Benahmed
Climate and Energy Policy Advisor
Third Way

Before the House Science Space and Technology Subcommittee on Energy

Hearing:
"From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future"

Friday, July 17, 2020

Chairwoman Fletcher, Ranking Member Weber, and members of the committee, thank you for the invitation to testify on the importance of clean energy innovation to an economic recovery that builds toward a clean energy future.

My name is Farah Benahmed and I am a Climate and Energy Policy Advisor at Third Way, a public policy think-tank based in Washington, DC. I'm honored to speak before you amongst my esteemed panelists, Jetta Wong, Dr. Emily Reichert, Jennifer States, and Dr. Lee Chattam during a time when our nation faces enormous challenges, and needs equally great solutions.

I would like to thank the members of this Committee and others in Congress who have supported major policies like the CARES Act and the HEROES Act, aimed at flattening the curve of COVID-19 cases, saving American lives, and protecting America's workers and businesses from the economic downturn this pandemic has caused. The nation needs additional, aggressive policy interventions that get this public health crisis under control and, ultimately, accelerates America's economic recovery.

While we work to resolve the public health and economic crises, the growing threat of climate change has not gone away. How we choose to rebuild will determine not only the speed and scale of our economic recovery, but also our ability to reach net-zero emissions by mid-century, if not sooner. We need additional policies that put Americans back to work, while making our society and economy much cleaner and more resilient.

Hearings like this one are crucial to highlight the policy solutions that can address these crises and help rebuild our economy, while avoiding the worst impacts of climate change. Clean energy innovation is an area that creates high-quality jobs across multiple industries and reduces carbon pollution. Prior to the pandemic, clean energy jobs had grown for the fifth straight year, employing over 3.3 million US workers.[1] By accelerating investment in the research and development of crucial clean energy technologies, we can meet our climate goals faster and at lower cost.

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[1] "Clean Jobs America 2020." E2, April 15, 2020, https://e2.org/reports/clean-jobs-america-2020/#:~:text=At%20the%20start%20of%202020,beyond%203.3%20million%20workers%20nationwide.&text=Jobs%20in%20renewable%20energy%20grew,a%20rebound%20in%20solar%20jobs. Accessed July 12, 2020.

With the enormous economic opportunity in the clean energy transition, other countries are racing to establish themselves as market leaders for emerging clean energy technologies. As a longstanding world leader in innovation, the United States has the institutions, resources, and capabilities to reap a major share of the benefits as an inventor and exporter of clean energy technologies. By investing further in demonstration and deployment, we can ensure that an even greater number of our emerging clean energy technologies have a chance to compete in global markets. Simultaneously, these investments in innovation will create millions of jobs, build up thousands of small businesses, and make the U.S. economy stronger and more resilient.

Policies Needed to Advance Clean Energy Innovation

There are a number of ways the federal government could advance clean energy innovation. My testimony will focus on the following policies:

1. Emergency relief for clean energy startups and entrepreneurs;
2. Increasing investment in clean energy innovation;
3. Committing to clean energy demonstrations; and
4. Establishing and scaling clean energy technology transfer programs.

1. Emergency Relief for Clean Energy Startups and Entrepreneurs

COVID-19 has created immense uncertainty in the market as the pandemic runs rampant across the United States. With market volatility plaguing investors, many in the venture capital community are holding onto their cash and refraining from making new investment decisions. In fact, VC investment activity has plummeted 25% since the pandemic hit.[2] Entrepreneurs face challenges in raising capital as they struggle through production and project delays and determine how to keep staff on payroll. The pandemic has thrown an unusually large wrench into the steady supply of materials. On a good day, supply chain disruptions can be debilitating for startups, especially if they have near-term deadlines to meet.

The pandemic could take many companies down, especially capital-intensive clean energy startups, without concerted federal action. Congress must ensure that an entire generation of early-stage innovative companies—including clean energy startups—does not die on the vine as part of its broader emergency measures to stabilize the economy and prevent further job loss. The U.S. government is well positioned to take on this challenge. The public sector can provide long-term financial support and technical expertise to innovative clean energy technologies until the private sector is ready to step in,[3] saving and supporting clean energy

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[2] "Venture Capital's New Normal." Axios, May 13, 2020, https://www.axios.com/venture-capital-investments-pandemic-0dcd8dd5-fafd-41b9-9ea9-84c3e012c7fa.html?utm_campaign=organic&utm_medium=socialshare&utm_source=email. Accessed July 10, 2020.

[3] "Catalyzing American Ingenuity: The Role of Government in Energy Innovation." American Energy Innovation Council, 2011,

startups that the United States and other countries desperately need to fight climate change and lay the groundwork for long-term economic prosperity.

Congress should implement the following actions:

- **Temporarily waive cost-share requirements.** Department of Energy research programs typically require awardees to achieve 20-50% cost-share from non-federal sources. This can be difficult for startups in the best of times and should be waived for the duration of the current national emergency.
- **Eliminate government payment delays.** Even when a small business successfully wins a federal agency contract or grant, they typically face a delay of 45–90 days before receiving the funds, awaiting final negotiations and payment processing. Congress should authorize the Treasury Department to make zero-interest advance loans to startups at the moment they receive a federal agency award notification.
- **Fix PPP's ability to reach startups.** The Small Business Administration's Payment Protection Program (PPP) should continue to process and accept loans, and receive increased funding in further rescue and recovery bills as needed. All small businesses that certify they need help in this crisis, including startups that are part of another firm's investment portfolio, should qualify for relief through this program.[4]
- **No-cost extensions and cash grants to keep existing government awardees afloat.** Congress should provide no-cost extensions and supplemental funding to federal agencies, allowing them to send emergency payments to cover payroll and other expenses to any existing contractor or grantee that cannot meet its performance obligations due to disruptions caused by the COVID-19 pandemic (e.g. shelter-in-place orders, restricted access to lab facilities, etc.). These direct cash payments from federal agencies, including to existing Small Business Innovation Research (SBIR) awardees, would likely be more rapid and efficient than the Paycheck Protection Program (PPP), which relies on private-sector banks as intermediaries.
- **Expand the SBIR Program to extend a lifeline to promising at-risk companies.** Eleven federal agencies have longstanding SBIR programs that together provide over $3 billion per year to support innovative technology startups and small businesses. While many clean energy startups are struggling to make ends meet, Congress should provide supplemental funding of at least $300 million (allocated among these agencies) to immediately make awards of $100,000 to prior high-quality SBIR applicants that were not selected simply due to funding limitations at the time. Within the DOE alone, this would mean about $30 million spread across 300 additional small businesses.

2. Increasing Investment in Clean Energy Innovation

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http://www.americanenergyinnovation.org/wp-content/uploads/2012/04/AEIC_Catalyzing_Ingenuity_2011.pdf. Accessed May 05, 2020.

[4]Glottmann, Sunny and Moller, Zach, "Three Ways to Save Small Businesses." Third Way, 21 May 2020, https://www.thirdway.org/memo/three-ways-to-save-small-businesses. Accessed May 22, 2020.

Effectively tackling the economic and climate crises must include at least a doubling of federal investment in clean energy research, development, demonstration, and deployment (RDD&D) over the next ten years. This recommendation has also been made by many credible institutions including the National Academies of Science[5] and the American Energy Innovation Council.[6] Funding for the Department of Energy must be increased to match the scale of the climate crisis, and the structure should be updated to maximize efficient utilization of these resources.

Since 1987, energy research has decreased from 14.4 percent of federal R&D to 5.3 percent by 2017.[7] The U.S. has continued to fall behind in terms of public energy R&D spending relative to national GDP as compared to other developed economies.[8] This means that the U.S. is spending a smaller share of research budgets on energy at a time when other countries are racing ahead to capture their share of what is a $40 trillion opportunity for global energy technology markets over the next 20 years.[9] Congress has shown great foresight and wisdom in bolstering federal RD&D investments at DOE in recent years, but America cannot rest on previous successes while the rest of the world continues to surge ahead. Without continuing to expand federally supported RD&D we further imperil our prospects to lead the global energy transition and reap the economic rewards that come with it.

3. Committing to Clean Energy Demonstrations

While increasing investment is essential, it's equally important that we are intelligent about how those investments are made. Today, clean energy researchers and entrepreneurs face an innovation gap, struggling to secure either private sector investment or federal funding for their technology demonstration projects. This "Valley of Death," where a lack of funding kills off many promising technologies before they are able to reach their full potential, can leave economically viable solutions behind.[10] Given the uncertainty and scale of investment involved, the private sector is generally unwilling to take risks in this area until the technologies are tested and proven by the government and the economic returns are assured.

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[5]National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. 2007. *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*. Washington, DC: The National Academies Press. https://doi.org/10.17226/11463. Accessed July 15, 2020

[6] American Energy Innovation Council. November 2018. Energy Innovation: Fueling America's Economic Engine. http://americanenergyinnovation.org/wp-content/uploads/2018/11/Energy-Innovation-Fueling-Americas-Economic-Engine.pdf. Accessed July 15, 2020.

[7] Townsend, Brad. April 4, 2017. "Energy Innovation: By the Numbers." American Energy Innovation Council. https://americanenergyinnovation.org/2017/04/energy-innovation-by-the-numbers/#:~:text=Declining%20Investment%20in%20Energy%20Innovation&text=By%202016%2C%20that%20number%20had,to%205.3%20percent%20by%202017. Accessed July 15, 2020.

[8] American Energy Innovation Council "Energy Innovation: Supporting the Full Innovation Lifecycle" February 2020 http://americanenergyinnovation.org/wp-content/uploads/2020/02/Energy-Innovation-Supporting-the-Full-Innovation-Lifecycle.pdf

[9]"World Energy Outlook 2018." International Energy Agency, 2018, https://webstore.iea.org/download/summary/190?fileName=English-WEO-2018-ES.pdf

[10]Wong, Jetta and Hart, David, "Mind the Gap: A Design for a New Energy Technology Commercialization Foundation." Information Technology and Innovation Foundation, 11 May 2020, https://itif.org/publications/2020/05/11/mind-gap-design-new-energy-technology-commercialization-foundation?mc_cid=0fbedf645b&mc_eid=e66b2f5eac. Accessed May 13, 2020.

Public investment in clean energy technology demonstrations is an effective way to jumpstart the economic recovery while advancing the technology solutions we require to reach our long-term climate goals. Demonstrations help identify system-level challenges, pinpoint opportunities for cost reduction, and validate the maturity of the tested technology. They also put people to work immediately in fields such as engineering and design, with construction, operations, and a host of other jobs following close behind. In some cases, jobs created by demonstrations of emerging technologies would be very well-suited for underutilized workers in struggling fields. For instance, skills from oil and gas drilling are directly transferable to the advanced geothermal sector, creating a pathway for workers to apply their skills to a job-rich and rapidly growing clean energy sector.

Technology demonstrations reduce the time to market for more efficient, cleaner technologies, which can give US companies a competitive advantage in the global marketplace. Federal and state policy assistance for renewable energy has helped catalyze a robust and expanding industry. Wind and solar costs have declined 10-fold over the last 10 years, and the positions associated with these technologies (e.g.,wind technicians and solar installers) were the fastest growing of any industry in the country up until the pandemic.[11]

Policymakers should replicate this success for technology solutions in harder to decarbonize sectors like transportation, manufacturing, and industry. A recent report from the International Energy Agency finds that three-quarters of the cumulative emissions reductions necessary to avoid the worst impacts of climate change will depend on technologies in early stages of development that need assistance in quickly getting to market.[12] Testing, validating, and scaling these early-stage technologies, like carbon capture, use, and storage (CCUS) for industrial processes and low-carbon hydrogen fuel for marine transport, will make it possible to get all the way to net-zero. It also gives the companies that develop these technologies an edge in capturing markets in Europe[13], Asia[14], and other areas of the world clamoring for low-carbon solutions; and it could create new opportunities to license, construct, manufacture, and supply components for these innovations around the world.

Demonstrations are most often a partnership between industry and the federal government, where both parties have an interest in the success of a project. However, with the economy in

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[11] "Fastest Growing Occupations." U.S. Bureau of Labor Statistics: Occupational Outlook Handbook, September 4, 2019. https://www.bls.gov/ooh/fastest-growing.htm

[12] "Clean Energy Innovation: Part of Energy Technologies Perspective." International Energy Agency, July 2020, https://www.iea.org/reports/clean-energy-innovation

[13] Strauss, Marine, "EU Lawmakers Agree to Include Shipping Emissions in EU Carbon Market." Reuters, July 7, 2020, https://www.reuters.com/article/us-climate-change-eu-shipping/eu-lawmakers-agree-to-include-shipping-emissions-in-eu-carbon-market-idUSKBN2481UD

[14] "Global Ring Main Unit Market (2020 to 2025) - Growing Renewable Energy Sector Presents Opportunities." PR Newswire, July 6, 2020, https://www.prnewswire.com/news-releases/global-ring-main-unit-market-2020-to-2025---growing-renewable-energy-sector-presents-opportunities-301088327.html

disarray from the global pandemic, it is more challenging for businesses to secure private capital. Without government support for demonstrations, only a fraction of promising new technologies have a chance of reaching commercialization. The federal government should significantly increase its investment in clean energy demonstration projects while temporarily reducing the amount the developer must contribute through what is often referred to as the non-federal "cost share."

Congress should start by investing in the following types of clean energy demonstrations that could quickly receive funding through DOE and start making an economic impact in the near future:

Advanced Nuclear Reactor Demonstrations: Congress provided $230 million in FY2020 to initiate a Department of Energy program aimed at demonstrating a minimum of two advanced nuclear reactors as soon as 2025. Teams of reactor developers, manufacturers, utilities, and others are already forming to apply for funding. At least that same level of investment should be made in the program each year to enable recipients to immediately expand their operations and quickly commercialize technologies that will advance America's climate, economic development, and national security goals. Committees in both the Senate and House have cleared legislation authorizing these demonstrations with bipartisan support.

Enhanced Geothermal Demonstrations: Conventional geothermal energy could be an important source of readily-available, carbon-free power, but only a small portion of the country has the right geological conditions to take advantage of it. Enhanced geothermal systems (EGS) use different techniques that could allow for geothermal energy generation in a much larger area of the country. Congress should invest $150 million to build four EGS demonstrations by 2025 and put the U.S. closer to unlocking massive new energy resources. With a number of similarities in drilling techniques, an expansion of EGS projects would also create opportunities for workers in the volatile oil and gas production industry to transition to a promising new clean energy sector. Committees in both the House and Senate have passed bills with bipartisan support to establish EGS demonstrations.

Energy Storage Demonstrations: Federal research has been critical to bringing down the price of lithium-ion batteries, currently the most ubiquitous battery technology. To fulfill the promise of renewables to affordably make up a major share of our power, additional innovation in energy storage is needed. Congress should invest $1 billion to support energy storage demonstrations for technologies by 2025 aimed at solving emerging grid challenges and paving the way for emissions reductions.

Clean Hydrogen Demonstrations: Hydrogen and fuel cells have the potential to significantly reduce carbon emissions from multiple sectors: power, transportation, buildings, and industry. With its wide-range of applications, hydrogen can tackle difficult to decarbonize industries and help the U.S. get all the way to zero. Realizing hydrogen's potential will also build a diverse set of jobs in a fast-growing industry. Congress should provide $1 billion for multiple hydrogen

demonstration projects. These demonstrations should, at a minimum, target industries such as port operations, heavy-duty land and marine transportation, heat and power applications in buildings, and iron/steel manufacturing. The funding should build on existing programs and existing partnerships among the national labs and DOE.

Carbon Capture Demonstrations: Carbon capture is one of the only technologies that can address emissions from hard-to-abate industrial processes, and remains a critical tool for decarbonizing natural gas power plants. Meanwhile, direct air capture (DAC) will be needed to remove gigatons of carbon dioxide from the air to achieve our climate goals. Recent research has shown carbon capture projects will generate hundreds to thousands of high-wage, high-skill jobs. Congress should provide $3 billion in funding for large-scale carbon capture, use, and storage (CCUS) demonstrations at industrial facilities in hard-to-abate sectors like steel, cement, or chemicals. An additional $3 billion should be invested in demonstrations of CCUS at natural gas power plants and DAC facilities (specifically no less than two natural gas facilities and one DAC facility).

4. Establishing and Scaling Clean Energy Technology Transfer Programs

The U.S. Department of Energy and other federal agencies have a wide range of programs with a proven track record of supporting talented energy technology entrepreneurs who create high-quality jobs.[15] As Congress crafts economic stimulus measures, it must ensure that clean energy technology transfer programs have the necessary authorizations and appropriations to rebuild an even larger and more dynamic clean technology startup ecosystem across the United States, laying a firm foundation for long-term US leadership in clean energy innovation.

Important technology transfer programs include, but are not limited to, the Lab-Embedded Entrepreneurship Programs (LEEP), Energy I-Corps, Small Business Vouchers, the National Incubator for Clean Energy, American-Made Challenges, Manufacturing USA, and the previously mentioned SBIR program. The success of these programs to-date could not have been made without the dedication and hard work of several offices at DOE, including the Office of Technology Transitions (OTT). Since 2015, OTT has effectively embedded itself within the Department's ecosystem and successfully managed and overseen programs focused on accelerating innovation. However, in order for the OTT to achieve optimal success, modernization of technology transfer programs is needed.

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[15]This section focuses primarily on programs at the U.S. Department of Energy, since the DOE accounts for roughly three-quarters of all U.S. government spending on clean energy R&D. This is not to say that other agencies do not have an important role to play, especially the Department of Defense, NASA, USDA, the National Institute of Standards and Technology (NIST), and the Department of Transportation. *Domestic Implementation Framework for Mission Innovation*, Executive Office of the President, November 2016. https://obamawhitehouse.archives.gov/sites/default/files/omb/reports/final_domestic_mission_innovation_framework_111616_700pm.pdf

The Energy Technology Transfer Act enhances and expands many of these programs, conveying the serious leadership and thoroughness of this committee in its efforts to address climate change. I also commend this bill for realigning OTT's mission around climate. Focusing solely on advancing clean energy technologies will be crucial to our nation's ability to achieve emissions reduction targets, while prioritizing energy sectors that are expected to see robust and sustained growth for decades.

Congress could take additional actions to strengthen OTT, most notably by giving this office its own budget line to enable greater certainty and direction in regards to federal spending. There are several programs related to OTT's mission that are managed elsewhere at DOE, such as the Lab-Embedded Entrepreneurship Program. Congress should also transfer management of all of these programs to OTT, so that project managers can more effectively share best practices, increase coordination, and scale these important programs under one roof.

Furthermore, scaling the innovative clean energy technologies we need to fight climate change will require large-scale efforts beyond the programs at the Department of Energy. The Increasing and Mobilizing Partnerships to Achieve Commercialization of Technologies for Energy Act (IMPACT for Energy Act), sponsored by Representative Ben Ray Luján and Senator Chris Coons, would establish a non-profit foundation aligned with DOE's mission is the kind of creative thinking needed to meet the scale of these crises. This foundation's ability to raise private capital would allow it to grow rapidly with less reliance on government appropriations. Like other successful federally authorized foundations, a DOE-allied foundation would increase private investment, public-private collaboration, and access to DOE's resources and facilities. It would create new opportunities for clean energy researchers and entrepreneurs looking to bring their technologies to market, leading to greater innovation, new startups, and the creation of new jobs and entire industries.

Conclusion

The challenges of the crises before us are a massive undertaking. They will require bold and thoughtful actions that aid this country in both the short- and long-run. Carrying out clean energy innovation policies can support struggling businesses and workers now and drive long-term economic growth, while also putting the United States on a faster, fairer path to net zero emissions by 2050, at the latest. Thank you again for the opportunity to testify today, and for this Committee's efforts on key legislation like the Energizing Technology Transfer Act and IMPACT for Energy Act. I look forward to the continued work and progress on these issues.

Biography – Farah Benahmed

Farah Benahmed is a Climate and Energy Advisor at Third Way, leading the team's clean energy innovation portfolio. She works on innovation-related policy development, oversees activities supporting Department of Energy appropriations, and leads two bipartisan working groups focused on advancing clean energy innovation. She was also a 2019 fellow at the Clean Energy Leadership Institute. Prior to joining Third Way, Farah worked at the Department of Energy's Office of Nuclear Energy and Avar Consulting.

Chairwoman FLETCHER. Thank you, Ms. Benahmed. Dr. Reichert, you're next.

TESTIMONY OF DR. EMILY REICHERT,
CHIEF EXECUTIVE OFFICER, GREENTOWN LABS

Dr. REICHERT. Thank you, Chairwoman Fletcher, Ranking Member Lucas, and Members of the Committee for giving me the opportunity to testify on the role the Department of Energy's technology transfer activities can play in our economic recovery from the COVID–19 pandemic.

My name is Emily Reichert, and I'm the CEO of Greentown Labs, the largest climate tech incubator in North America located just outside of Boston in Somerville, Massachusetts. Founded in 2011, our mission is to provide startups with the community, resources, and connections their companies need to thrive. What began as four startups really just looking to share the cost of rent has grown into a community of more than 100 early stage companies tackling challenges within the largest greenhouse gas emitting sectors: electricity, buildings, transportation, agriculture, and manufacturing. Since our founding, we've supported more than 280 startups that have created more than 6,500 jobs, raised more than $850 million in capital, and generated at least $1.5 billion in regional economic impact.

Since its inception, Greentown's business model has relied mostly on private-sector funding. The membership fees paid by our startups and direct support from more than 50 corporate partners. These partners help us meet our operating expenses, keep cost for startups low, and include world-leading energy companies such as Shell, Chevron, BHP, NG, EDF, Veolia, and NRG.

With the support of many of these partners, last month, we announced our plans for our first-ever out-of-state expansion to Houston, Texas. Opening in spring 2021, Greentown Houston will be the first climate-tech-focused incubator in the city. Our aim is to build a bridge between Boston and Houston and have the best and brightest engineering and business minds working together to address climate change.

In fact, Massachusetts can provide an important case study for clean energy as a driver for economic recovery and growth. Since the end of the recession, the clean energy industry here has grown by 86 percent with 111,800 clean energy workers in the State as of 2019. Already strong in Texas, the clean energy sector there has massive potential to drive recovery from COVID–19, and the strong engineering talent base there can be redeployed to address climate change through cleantech innovation.

With this in mind, Greentown is thrilled to provide its support for the proposed *Energizing Technology Transfer Act* and the *IMPACT for Energy Act*. The provisions of these acts will be crucial for the recovery and growth driven by the cleantech industry.

COVID–19 has posed unprecedented challenges for both cleantech startups and cleantech incubators. For cleantech startups, investments and hiring of new employees has been delayed as startups think to conserve cash for longer runways before new funding can be secured. COVID–19 has also made it more challenging for them to achieve technical and business milestones

due to loss of lab access, stalled pilot projects, and disrupted supply chains.

From the incubator perspective, Greentown's operations had to cease for nearly 3 months, resulting in a significant loss of revenue detrimental to our financial health and our long-term ability to provide critical services to entrepreneurs. We and our cleantech startups face a challenging path forward without additional support. Thus, we strongly support the creation of the National Clean Energy Incubator program, as described in the proposed *Energizing Technology Transfer Act* legislation before this Committee. We are pleased to see language specifically providing support for operational costs, which fills a much-needed gap even in normal times.

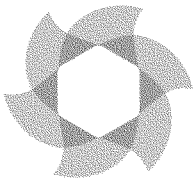
Furthermore, we applaud the expansion of the support for the I-Corps program and the Clean Energy Technology University Prize competition. These competitions help curate the best talent and innovations from universities and transfer them successfully into the marketplace. In the wake of COVID–19, many enterprising students across the Nation will likely choose to build new companies that seek to address major energy and environmental challenges. University prize competitions will provide educational experience, mentoring, visibility, and a path to funding for these budding entrepreneurs.

Finally, we strongly support the *IMPACT for Energy Act*, which would address critical gaps in the commercialization path of innovative clean technologies. The importance of engaging the private sector and the investment community in addressing climate change through innovation cannot be understated. In particular, the establishment of an impact investment fund will help fill critical gaps in the path to market for early stage clean technologies.

Finally, we are excited to see the vision for a specific purpose-built entity to engage the private sector in climate-focused innovation become a reality through the creation of a DOE foundation. Based on the experiences of Greentown Labs, it is clear that this legislation could play a crucial role in catalyzing cleantech innovation and driving the COVID–19 recovery in Massachusetts, Texas, and across the Nation.

As this Committee continues to review the potential contributions of DOE technology transfer activities to economic recovery from the pandemic and to the energy transition, I hope you keep our experience in mind. Thank you again for inviting me here today and for the opportunity to speak on such an important issue.

[The prepared statement of Dr. Reichert follows:]



Greentown Labs

House Committee on Science, Space, and Technology

Subcommittee on Energy

Testimony on "From Lab to Market: Accelerating our Progress Toward Economic Recovery and a Clean Energy Future"

Submitted by: Emily Reichert, Ph.D., M.B.A.
Chief Executive Officer, Greentown Labs
Somerville, MA and Houston, TX

July 17, 2020

Thank you Chairwoman Bernice Johnson, Chairwoman Lizzie Fletcher, Ranking Member Randy Weber, and members of the subcommittee for giving me the opportunity to testify on the role the U.S. Department of Energy's (DOE's) technology transfer activities can play in accelerating economic recovery from the current COVID-19 pandemic and commercializing clean technologies for a cleaner, more resilient future. My name is Dr. Emily Reichert and I am CEO of Greentown Labs, the largest climatetech incubator in North America, currently home to more than 100 climatetech and cleantech companies.

About Greentown Labs

I would first like to provide you with some background on Greentown Labs (also referred to as "Greentown"). Our headquarters in Somerville, Massachusetts, spans a 100,000-square-foot campus, comprising prototyping labs, a wet lab, and office and community spaces to enable a vibrant community of entrepreneurs solving climate and environmental challenges. The mission of Greentown Labs is to provide these startups with the community, resources, and connections their companies need to thrive.

In its role as an incubator, Greentown Labs provides a place for startups to actualize their prototypes, connect with their first customers, and begin pilot testing. Before joining incubators, startups often begin their initial technology development during their founders' time at university. Companies that are accepted into Greentown Labs have often raised a small amount of money and have gone through business plan competitions and accelerator programs, where they have learned basics of entrepreneurship and refined their fundraising pitch. As a next step *after* the business plan competition and accelerator program phases, incubators provide curated prototyping resources, programming, and connections that help startups develop, test, and deploy their solutions successfully at scale.

At Greentown Labs, startups are immersed into a community of entrepreneurs and are able to take advantage of a curated suite of programming and events. At our 100,000-square-foot campus in Somerville, Massachusetts, we offer roughly 40,000 square feet of flexible, affordable prototyping and wet lab space, along with a shared machine shop and electronics lab, to allow startups to take their technology from initial R&D to rapid prototyping while preparing for manufacturing and commercial development. Greentown provides its members access to a strong network of investors, corporate partners, and manufacturers that play a critical role in supporting our entrepreneurs and helping their companies to scale.

Greentown Labs recently announced our intention to expand—for the first time outside of Massachusetts—to Houston, Texas. Greentown Labs Houston will be the first climatetech-focused incubator in the city. Houston does not have a convening incubator for the cleantech community like Greentown Labs, and this gap in the market was one key factor that attracted us to explore expansion there. The incubator will open in Spring 2021 to provide 40,000 square feet of office, prototyping lab, and community space alongside programming for Houston-area startups. We believe opening our second location in Houston, Texas, is the best way to broaden our impact and help to accelerate the energy transition through climatetech entrepreneurship, in partnership with the world-leading energy organizations headquartered there.

Houston has long been known as the energy capital of the world and we believe Texas is well-positioned to lead the global energy transition. Texas produces about one-fourth of the country's wind power, and its wind energy industry employs more than 25,000 people. Houston has the largest concentration of renewable companies anywhere in the U.S., with more than 130 solar and wind companies based in the Houston area. The City of Houston municipality is already powered by 92 percent renewable energy, and is on track to being the first major U.S. city to be powered by 100 percent clean energy. Through the

deployment of innovative, new clean technologies, some of which may emerge from Greentown Labs, Houston can reach its goal of carbon neutrality by 2050.

Both Greentown Labs and the City of Houston believe building the cleantech innovation ecosystem can be a critical part of the state's economic recovery from COVID-19, and we hope to be a catalyst for further progress on the energy transition. With the opening of Greentown Houston, we aim to build a bridge between Massachusetts and Texas to have the best and brightest engineering and business minds in energy working together on the development and deployment of innovative technology to drive the global energy transition.

Greentown's History and Impact

Greentown Labs was founded in 2011 by four startups that needed space to get dirty and build their cleantech solutions. These companies joined forces in a small space in east Cambridge, Massachusetts and quickly attracted more startups with a shared commitment to cleantech innovation and collaboration among peer entrepreneurs. What started with four startups simply needing to share the cost of rent has grown into a community of more than 100 early-stage climate and cleantech companies tackling challenges within the very largest greenhouse gas emitting sectors: Electricity, Buildings, Transportation, Agriculture, and Manufacturing.

Since our founding, Greentown Labs has supported more than 280 startups, with a survival rate of 86 percent. As of Q4 2019, these startups have collectively:

- Created more than 6,500 jobs,
- Raised more than $850 million in capital,
- Generated nearly $550 million in revenue,
- Filed for over 400 patents,
- Demonstrated a value add of $850 million in gross regional product in 2019, and
- Generated at least $1.6 billion in regional economic impact.[1]

Greentown's Business Model: Strong Private Sector Support

Today, Greentown Labs is a public benefit corporation with a staff of 34, including 23 full time employees in Boston and two employees in Houston. In 2019, Greentown Labs' operating budget was just over $8 million. Of that, more than two-thirds of our revenue came from our startups' membership fees and one-third came from corporate partnerships, which help us keep membership fees low for startups. Our expansion to Houston, Texas is

[1] Reported impacts found via quarterly surveys and IMPLAN software.

funded 100 percent by corporate partners to date. Greentown Labs' corporate partners include world-leading energy companies, many of whom have significant operations in Texas, including Shell, Chevron, BHP, ENGIE, NRG, EDF, Enel, Veolia, DSM, Mitsubishi Chemical Holdings, and Schneider Electric.

Greentown Labs wouldn't be where it is today without the support of forward-thinking corporate partners committed to energy innovation and climate action. These partnerships help us meet our operating expenses and have resulted in dozens of investments, pilots, customer agreements, and partnerships with our startups. In addition, corporations often provide valuable in-kind resources, such as legal services or discounted software, industry perspectives, and market insight for our members.

Since its inception, Greentown Labs has relied mostly on private funding, with public sector funding making up less than 4 percent of our budget in 2019. In 2015, Greentown Labs received its first federal funding in the form of a $50,000 award from the U.S. Small Business Administration (SBA) Growth Accelerator Fund Competition. In 2019, we were honored to receive an award from the U.S. DOE/NREL and be named as a Power Connector for the American-Made Solar Prize, as well as to receive funding from the Massachusetts Clean Energy Center (MassCEC) IncubateMass grant program at the state level.

Funded by the DOE Solar Energy Technologies Office, the American-Made Solar Prize is a multi-stage prize competition that is designed to energize the U.S. solar manufacturing and energy innovation ecosystem. As a Power Connector, we leveraged our network of resources and expertise to support solar entrepreneurs in the competition. The MassCEC IncubateMass program provides funding to Massachusetts incubators with the goal of growing the clean energy innovation ecosystem and commercializing cleantech startups through incubator support.

The Role of the U.S. DOE in Cleantech Startup Support

The U.S. DOE plays a critical role in catalyzing clean energy innovation, improving the competitiveness of cleantech research and development, and generating follow on investment for early stage clean technologies. Greentown Labs has had firsthand experience of the value add and funding gap filled by DOE-led grants and competitions. Many of Greentown Labs' members have benefited from the Advanced Research Projects Agency-Energy (ARPA-E), Small Business Innovation Research (SBIR), and Small Business Technology Transfer (STTR) programs that are administered by the DOE, in addition to those from the National Science Foundation (NSF) and other federal agencies. These

programs provide essential support to early-stage cleantech companies through non-dilutive funding, mentorship, connections, and commercialization support.

SBIR/STTR Programs

This crucial support begins at the university, where DOE funding encourages students to engage in clean energy technology development to solve big challenges. After receiving support from the DOE over the last five years at the University of Texas at Austin, TexPower recently received a DOE SBIR Phase I grant for commercialization efforts of its battery technology innovation. A prospective member for Greentown Houston, TexPower aims to commercialize cobalt-free, high-capacity, drop-in cathode materials for lithium-based batteries commonly used for electric vehicles (EVs). As the U.S. manufacturing base for these metals is limited, most EV manufacturers must rely on East Asia to fill the gap. TexPower's technology will reduce reliance on these materials, ultimately enabling EVs to become more competitive in cost and performance against petroleum-driven combustion engines. Their DOE Phase I SBIR grant will enable them to start scaling their technology from the laboratory to industrial fabrication.

ARPA-E

ARPA-E is another federal program that fills a critical gap for early-stage ventures by funding game-changing energy technologies that are too early for private investment. Houston-based Syzygy Plasmonics is creating a hydrogen fuel cell technology that produces a cheaper source of energy that releases fewer carbon emissions. Syzygy was a recipient of a 2019 ARPA-E award, which helped the company develop reactor technology to process carbon emissions and create hydrogen. These programs enabled Syzygy to scale productivity of its technology by more than 10,000 times and improve its energy efficiency by 100 times. Furthermore, ARPA-E prizes better prepare startups to scale their operations and to generate follow-on investment, with Syzygy raising $5.8 million in private funding for the company to grow its team and scale into its own lab space in Houston.

H2 Refuel H-Prize

Greentown Labs member company Ivys Energy Solutions is a prime example of how startups benefit from DOE programs. Building on its founders' decades of experience in the hydrogen fuel cell industry, Ivys is developing innovative hydrogen refueling infrastructure to enable the successful near-term rollout of electric vehicles. In 2017, Ivys and its partners McPhy Energy North America (Massachusetts) and PDC Machines (Pennsylvania) won the DOE's $1 million H2 Refuel H-Prize Competition. The goal of the competition was to develop

a safe, affordable, readily deployable hydrogen refueling appliance for electric vehicles. This million-dollar prize enabled Ivys to develop its novel SimpleFuel station, which it is currently piloting at Greentown Labs in Massachusetts, at a Toyota hydrogen car manufacturing plant in Japan, and at other sites around the globe.

American-Made Solar Prize

Greentown Labs was proud to serve as a Power Connector in the American-Made Solar Prize, partnering with the DOE and the National Renewable Energy Laboratory (NREL) to drive solar innovation. Through this program, we provided participants access to our strong national and local network of manufacturers, startups, and strategic partners in the solar industry. To help amplify the DOE and NREL's efforts to revitalize the U.S. solar manufacturing industry, Greentown Labs hosted the 2019 American-Made Solar Prize Set! Demo Day.

VesprSolar, one of our newer members, learned about Greentown Labs through the competition after receiving mentorship and advice on a commercialization approach from our team. VesprSolar is a solar hardware startup that is defining a new industry standard for PV module attachment. The VesprSolar V-Clip is a new multi-functional, low-cost PV module fastener that will drive significant savings in utility-scale installation and maintenance costs. VesprSolar's V-Clip is a Round 2 Semi-finalist of the 2019 American-Made Solar Prize, recognized as a top 20 solar innovation, and is now competing in the final stage.

COVID-19 Impacts on Cleantech Startups and Cleantech Incubators

Since March 2020, COVID-19 has posed unprecedented challenges for both cleantech startups and for the incubators that provide them support and services. In the earliest days of the pandemic, many investors warned startups of the economic challenges ahead, advising them to cut their costs by 30 percent in order to extend their runway. COVID-19 has delayed new investment and the hiring of new employees as startups seek to conserve cash for unanticipated, longer runways before funding can be secured. As fears rose around cleantech investment prospects coming to a standstill, cleantech startups with limited runways or that were actively fundraising were disproportionately affected. Furthermore, available programs such as the CARES Act Paycheck Protection Program and other loan programs that benefited many sectors of the economy were not a good fit for startup companies due to issues with affiliation, among others.

COVID-19 has also made it more challenging for startups to achieve technical and business milestones. As customer projects came to a halt—some indefinitely—revenue-funded

companies that were counting on those orders seemed to struggle more than venture-capital-backed companies. Additionally, the economic slowdown resulted in disrupted supply chains and stalled pilot projects that would have been crucial for startups proving their technology in the field. Following the shutdown of building operations in the wake of COVID-19 outbreaks, startups heavily reliant on lab access experienced detrimental impacts on progress against their technical milestones and grant deliverables.

From the incubator perspective, in order to adhere to state and local guidance, Greentown Labs' operations had to cease for nearly three months, resulting in a significant loss of revenue that has been detrimental to Greentown Labs' financial health and long-term ability to provide critical services to entrepreneurs. Although we received a much-needed forgivable loan through the CARES Act Paycheck Protection Program, we have already had to reduce headcount. As noted above, over two-thirds of Greentown's revenue is derived from membership fees startups pay to access lab and office space.

As well, in the past few months, Greentown has had to rapidly learn how to run a virtual incubator, focusing specifically on providing unique virtual programming and connection to experts for our members during this challenging time. Today, we are operating at about 25 percent of our original occupancy while continuing to develop and deliver virtual programming resources. With both continued uncertainty about the nation's economy as a whole and its impacts on private investment in startups, and the continuing impact of necessary COVID-19-related restrictions on our operations, we face a challenging path forward without additional support.

Catalyzing a National Recovery Driven by Clean Energy

As we shift our focus from responding to the virus to recovery from the virus, we have a significant opportunity to align efforts to build our economy back better than before. Support of cleantech innovation and building resilient systems can and should be part of our economic recovery. In Houston, the city's energy expertise and strong engineering talent base can be re-utilized to address climate change through cleantech innovation. Already strong in Texas, this sector provides massive economic potential for sustainable and equitable growth.

As we've seen since the last recession, clean energy can be a huge driver for workforce development and economic opportunity. The Massachusetts example, following the 2007-2009 recession, provides an important case study. Overall, the Massachusetts clean energy sector has added more than 52,000 jobs since 2010—a growth rate of 86 percent over that time. As of 2019, over 111,800 clean energy workers could be found in every

Massachusetts county, and the state's cleantech industry contributes $14 billion to the Massachusetts Gross State Product. And of those workers, 61 percent are employed by small businesses, which is the size of most Greentown Labs companies.

With this experience in mind, Greentown Labs is thrilled to provide its enthusiastic support of the proposed "Energizing Technology Transfer Act" [2] and the "Increasing and Mobilizing Partnerships to Achieve Commercialization of Technologies (IMPACT) for Energy Act" (H.R. 3575).[3] Both Acts introduce programming and support that will be crucial for COVID-19 recovery in the cleantech industry. Several program elements critical to the recovery of cleantech incubators and startups in the wake of COVID-19 are highlighted below.

National Clean Energy Incubator Program

In 2014, the DOE's National Incubator Initiative for Clean Energy (NIICE) grant program provided support for individual incubators and launched the Incubatenergy Network made up of cleantech incubators and accelerators across the nation, including Greentown Labs. The goal of the Network was to enhance collaboration, encourage sharing of best practices, and help standardize incubator performance metrics. Through the Incubatenergy network, Greentown Labs has developed strong and lasting partnerships with incubators and accelerators across the country located in Hawaii, California, Texas, Michigan, Illinois, and New York. It is exciting to imagine the possibilities for collaboration and growth benefiting cleantech startups throughout the country that will be spurred by the National Clean Energy Incubator Program as proposed in the "Energizing Technology Transfer Act" legislation before the committee.

In particular, the National Clean Energy Incubator Program described in the proposed legislation will be crucial for filling a much-needed gap in cleantech incubator operations support. Even in normal times, one of the biggest challenges faced by incubators is funding operational costs. We are pleased to see language specifically highlighting this as an allowable expense. Funding of this type, especially in the wake of COVID-19, will go a long way in meeting this challenge and in helping incubators and the startups they support recover.

This Program additionally would also allow Greentown Labs and other incubators to engage and invest in diversity, equity, and inclusion efforts. Participation of underrepresented groups—including women and minorities—have been a long-standing issue in the cleantech

[2] This proposed bill will be introduced during the 2nd session in the 116th Congress (2019 - 2020).

[3] Increasing and Mobilizing Partnerships to Achieve Commercialization of Technologies (IMPACT) for Energy Act, H.R. 3575, 116th Cong., 1st Sess. (2019 - 2020).

industry, and incubators have often lacked necessary resources to engage in meaningful outreach and develop programming to support these groups. Funding from the National Clean Energy Incubator Program could enable support and engagement of traditionally underrepresented groups to be more core to the operations of an incubator. In the Houston area alone, we've identified a dozen organizations focused on supporting traditionally underrepresented entrepreneurs that we would like to work with as we build our operations there. Such programming will help ensure an equitable clean energy recovery, ensuring that *all* of the human capital and talent the U.S. has to offer is applied to the challenge of climate change.

Clean Energy Technology University Prize Competition

Furthermore, we applaud the expansion of support for the I-Corp program and the Clean Energy Technology University Prize Competition put forward in the proposed "Energizing Technology Transfer Act" legislation, which we see as incredibly important to strengthening the bridge between academia and launching an entrepreneurial venture. Both MIT's many startup programs and Rice University's Rice Alliance for Technology and Entrepreneurship have been nationally recognized for their role in spurring cleantech entrepreneurship and commercialization. University competitions, such as the MIT Clean Energy Prize and the Rice University Business Plan Competition, help curate the best talent and technological innovations from university labs to be transferred successfully to the marketplace.

These programs are essential for encouraging entrepreneurship, generating student excitement about clean energy, and driving technology toward commercialization. The majority of Greentown Labs' members have participated in such programs, many going on to win first place. Greentown Labs member Infinite Cooling won the top Cleantech University Prize at the 2017 MIT Clean Energy Prize ($100K), after winning top prizes in numerous other competitions and accelerators and in the DOE National Cleantech Competition.[4] Infinite Cooling also emerged as the top company in the 2018 Rice Business Plan Competition, hosted by the Rice Alliance, winning a total of $400K in prizes. Infinite Cooling's innovative technology can reduce power plant water consumption and costs by capturing and reusing steam escaping from cooling towers.

In the wake of COVID-19, with large corporations hiring less due to a slowing economy, it is likely that many enterprising students at Rice University, MIT, and other universities across the nation will choose to build new companies that seek to address our major energy and

[4] Other Greentown members who have won the MIT Clean Energy Prize include Aeroshield (2019), Medley Thermal (2019), Infinite Cooling (2016), Heila Technologies (2016), Sistine Solar (2013), and Cool Chip (2011).

environmental challenges. Support for the Clean Energy Technology University Prize Competition will provide the educational experience, mentoring, visibility, and path to funding these young entrepreneurs will need to launch businesses that create jobs and grow our economy back stronger than ever. These programs will play a crucial role in catalyzing cleantech innovation and driving the COVID-19 recovery.

IMPACT for Energy Act

Finally, we strongly support the "IMPACT for Energy Act," which would provide necessary funding for critical gaps in the early stages of cleantech startup development and in the commercialization of innovative technologies. In particular, the establishment of an Impact Investment Fund would help fill critical current private sector funding gaps in the path to market for early-stage clean technologies.

As well, the importance of engaging the private sector and investment community in addressing climate change through innovation cannot be understated. At Greentown Labs, we believe corporate partnerships are paramount to scaling clean technology, and they provide critical, direct support for our innovation programming. Through our work with 50+ corporate partners, our organization has direct experience in engaging the private sector in these efforts, resulting in investments, commercial pilots, joint development agreements, and licensing agreements for our incubated startups. We are glad to see the vision for a specific purpose-built entity to engage the private sector in climate-focused innovation become a reality through the creation of a DOE Foundation.

Conclusion

Based on the experiences of Greentown Labs, and our partners around the country, it is clear that legislation to support the development of clean energy innovation companies is critical to the nation's recovery following COVID-19 and to meet the urgency of climate change. As this committee continues to review the impacts of technology transfer activities at the Department of Energy and their potential contributions to economic recovery from the current COVID-19 pandemic, I hope you will keep the experience of Greentown Labs in mind. The DOE is in a perfect position to administer programs that will accelerate cleantech commercialization and drive job growth for an equitable, clean-energy-fueled recovery. Thank you again for inviting me here today and for the opportunity to speak on such an important issue.

Greentown Labs

Emily Reichert, Ph.D.
Chief Executive Officer
Greentown Labs

Dr. Emily Reichert serves as Chief Executive Officer of Greentown Labs, the largest climatetech incubator in North America. As the organization's first employee, Emily spearheaded the rapid growth of Greentown Labs, incubating hundreds of climate-focused startups that have created thousands of jobs and attracted partners from around the world. Today, Greentown Labs has grown to 35 employees managing a community of nearly 100 startups and 100,000+ sq. ft. of space, headquartered in Somerville, Massachusetts with a second location currently in development in Houston, Texas.

Emily started her career at Arthur D. Little as a Ph.D. scientist and progressed into R&D, business development and general management roles. Prior to Greentown Labs, she was the Director of Business Operations at the Warner Babcock Institute for Green Chemistry where she helped grow the angel-funded startup into a sustainable contract R&D business with a mission to minimize environmental impact of chemical products.

Emily has been appointed to leadership positions on innovation, economic development, entrepreneurship, and clean technology commercialization at the city, state, and federal level including the City of Somerville's Chamber of Commerce, the Massachusetts Governor's Economic Development Planning Council, the Massachusetts Advanced Manufacturing Collaborative, and the U.S. Secretary of Commerce's National Advisory Council on Innovation and Entrepreneurship.

She holds a Ph.D. in Physical Chemistry from the University of Wisconsin-Madison and earned her MBA from MIT Sloan School of Management.

Chairwoman FLETCHER. Thank you, Dr. Reichert. Dr. Cheatham.

TESTIMONY OF DR. LEE CHEATHAM,
DIRECTOR OF TECHNOLOGY DEPLOYMENT AND OUTREACH,
PACIFIC NORTHWEST NATIONAL LABORATORY

Dr. CHEATHAM. Good afternoon, and thank you, Chairwoman Fletcher, Ranking Member Weber, and Full Committee Ranking Member Lucas, as well as the Members of the Committee. Thank you for the opportunity to appear before you today and discuss the role of the Department of Energy's national laboratories in making forward progress on an economic recovery and long-term clean energy future.

My name is Lee Cheatham. I lead the Pacific Northwest National Laboratory's Technology Transfer Office, and I serve as Chair of the National Laboratory Working Group on Tech Transfer. My testimony today is on behalf of my work at PNNL and my role serving as Chair of the NLTT. It does not represent the views of the Department of Energy.

Today, I want to offer three proposed perspectives on how the national laboratories contribute to that prosperous clean energy future. First, direct interaction between national laboratories and private sector companies enhances the transition of research to market. The national laboratories have unique capabilities that can help companies remain innovative and competitive. We make those capabilities available to companies in the form of research partnerships, access to scientific facilities, and licensing of intellectual property. These increasingly sophisticated partnerships are enabled by unique facilities built for collaboration in research, testing, and product development. For example, PNNL's planned Grid Storage Launchpad will bring together researchers from national labs, universities, and industry to validate innovative storage materials and realistic grid-operating conditions, thus advancing the next generation of technology for grid storage.

Second, research across all national laboratory mission areas generates opportunities for technology transfer. The national labs' research in areas for lightweight materials, recycled carbon to computing to next-generation electric grid represent just a few of those opportunities. In every case, successful technology transfer relies in part upon the national laboratories' partnerships with companies, universities, and consortia. Again, for example, the Joint Center for Energy Storage Research and the Battery500 Consortium are creating transformative materials and batteries with significantly higher power densities than the electric grid storage and for new electric vehicles.

Basic and fundamental research is a key part of the laboratory system's portfolio, and it's an important driver of our technology transfer activities. I have personally found that some of the most creative and interesting commercial applications of technology have come from early stage research. For example, measuring the ion collisions at Brookhaven National Laboratory's Relativistic Heavy Ion Collider requires special high-performance detectors and data collection systems. The software managing these data also turns out to be useful for managing internet traffic congestion. A local

startup company has now been formed to commercialize this technology in partnership with Brookhaven.

Seemingly far away from fundamental science, let's not forget that small businesses regularly require support in addressing technical and market challenges. When they seek a technical expert, search for a lab-generated piece of intellectual property, or request engineering skills to overcome a challenge in their product line, the programs included in this legislation that we're discussing today, the Lab Partnering Service, Technology Commercialization Fund, Technology Assistance Program, and Small Business Vouchers will prove valuable.

Third, national laboratory researchers direct experience with industry enhances their research and accelerates technology transfer. These direct interactions with companies help our scientists understand business challenges. Entrepreneur training at the laboratories accelerates this learning and gives them the necessary skills to identify the commercial potential of their research. The Energy I-Corps program mentioned in the legislation is an important resource for educating researchers, and many of the national laboratories offer entrepreneurial LEAP (Lean Entrepreneurship Advancement Program) programs. Together, these two accelerate tech transfer and are key incentives to recruiting scientists and engineers into Federal service.

Before concluding, let me acknowledge that the situation that we face with the COVID–19 pandemic and economic downturn requires our highest level of attention. National labs have developed technologies that are being deployed in the fight against the virus. For example, Paerosol is a micro-aerosol disinfecting technology developed by PNNL and licensed to NanoPure, a South Carolina company. Now, the Florida State Firefighters Association is currently using Paerosol to disinfect key facilities, including hospitals, schools, and first response vehicles.

Also recently, the national laboratories have further opened access to our portfolio of research and technology to any interested companies. At many laboratories now, a company can access and evaluate a technology based simply on a two-page agreement and at no cost.

So, in conclusion, let me say the national labs share the goals of this Committee, this hearing today, to improve the technology transfer at our national laboratories to leverage Federal investment in research for the benefit of our Nation's economy, health, and security. On behalf of the NLTT, I want to thank you for the opportunity to testify, and I look forward to answering any questions you have.

[The prepared statement of Dr. Cheatham follows:]

Statement of Dr. Lee Cheatham

Director, Office of Technology Deployment and Outreach

Pacific Northwest National Laboratory

Before the
United States House of Representatives
Committee on Science, Space and Technology / Subcommittee on Energy

July 17, 2020

Good afternoon. Thank you, Chairwoman Fletcher, Ranking Member Weber, and Members of the subcommittee. I appreciate the opportunity to appear before you today to discuss the role of the Department of Energy (DOE) national laboratories in making progress toward an economic recovery and a long-term, clean-energy future.

My name is Lee Cheatham, and I lead the Office of Technology Deployment and Outreach at Pacific Northwest National Laboratory (PNNL), a DOE national laboratory located in Richland, Washington. My office is responsible for all technology transfer from PNNL's intellectual property portfolio. I also serve as Chair of the National Laboratory Working Group on Technology Transfer (NLTT.) This working group is comprised of the technology transfer principals at each of the national laboratories.

My testimony today is on behalf of my work at PNNL and my role serving as Chair of the NLTT but does not represent the views of DOE.

The Energy Department's seventeen national laboratories are a system of intellectual assets unique among world scientific institutions that serve as regional engines of economic growth for states and communities across the country. Today, I will address three perspectives on our role in the nation's capacity for science, engineering. and innovation.

First, national laboratories promote and develop broad interactions with industry, allowing a natural handoff of lab-developed technology to companies creating market-serving products.

Second, the technology developed and transferred to private-sector partners draws on research conducted in all of DOE's mission areas. Such programs include the broad set of basic and fundamental sciences, energy research and technologies, and national security.

And third, successful transfer and commercialization begins with a research staff who understand the market. By providing laboratory staff with exposure to companies and markets, researchers better understand the value of increasing the speed and frequency of transitioning new ideas and technology from lab to market.

The interplay of these three perspectives – strong industry connections, broad mission-related research, and unique science and engineering workforce – allows the National Laboratory System to successfully meet the DOE mission challenges of scientific breakthroughs, scale-up engineering, and innovation-based economic competitiveness.

Each of the seventeen national laboratories has as its primary steward a major DOE office. (See the list of DOE Laboratories and DOE Office stewards at the end of this testimony.) DOE's Office of Science is the nation's largest federal sponsor of basic research in the physical sciences. It stewards ten national laboratories. Three laboratories are stewarded by the National Nuclear Safety Administration. Four national laboratories are stewarded by other DOE program offices. Sixteen of the national laboratories are federally funded research and development centers (FFRDC) and are managed by non-federal entities through Management and Operations Contracts with DOE. One laboratory, National Energy Technology Laboratory (NETL), is a fully federal laboratory and all staff members are federal employees.

Research and development conducted by the national laboratories aligns with the mission areas for which DOE has responsibility, including basic science, national security, energy, environmental management, and nuclear technologies. Each laboratory has an identified core mission area in which it conducts research. At the same time, most national laboratories conduct research across many of DOE's mission areas. The National Laboratory System has a unique asset in the 27 user facilities, funded by DOE's Office of Science. These large-scale scientific facilities are beyond what any single research organization can afford. They operate as shared-access resources to the scientific community. Researchers gain access through competitive, peer-reviewed proposals and agree to make publicly available their findings.

All national laboratories actively engage in transferring research and technology to the private sector. The Report on the Utilization of Federal Technology developed by the DOE Office of Technology Transitions for the most recent five-year period shows more than 2,300 active agreements each year with private sector and non-DOE federal partners and more than 750 active cooperative agreements each year with non-federal partners. During that same five-year period, the national laboratories reported an average each year of 1,700 new inventions, nearly 1,000 patents filed and 3800 active licensed technologies.

Before proceeding with discussion of the three perspectives outlined above, let me acknowledge that the situation we face in the COVID-19 pandemic and associated economic downturn requires the highest level of attention for those of us in the national laboratory system. With respect to technology transfer, the national labs have responded in two ways. First is to identify existing technologies, then support and promote them to address the COVID-19 risks. One example is a micro aerosol disinfecting technology called Paerosol. Developed at PNNL, it was licensed in 2018 to NanoPure, a South Carolina company. Preliminary test results are now showing Paerosol's effectiveness in eliminating COVID-19 particles. As one demonstration,

Florida State Firefighters Association has deployed multiple response units to disinfect fire stations, restaurants, businesses, hospitals, schools and first response vehicles using Paerosol.

Second, national laboratories have opened access to our portfolio of technologies for evaluation by reducing the time required, administrative barriers and cost. Again, using PNNL as just one example, we waived the fee for an exploratory license on each of our available technologies through December 31, 2020. The easy, two-page license agreement, now with no fee included, has been exercised numerous times by companies seeking to address the COVID-19 challenge.

Direct interaction enhances transition of national laboratory research to the market

National laboratories work directly with private sector companies

The national laboratories have unique capabilities that can help companies differentiate their products. These capabilities are developed through federally funded research and development programs. They are available to companies on a cost-reimbursement basis. Such Lab-Industry projects can be fully funded by the company (or companies) involved to address specific technical challenges the company faces. Alternatively, cooperative research and development projects provide a way for national laboratories and companies to work jointly, when technical contributions from the laboratory and company are required.

The DOE Office of Science user facilities, operated by the national laboratories, provide unique capabilities available for use by outside organizations. Tens of thousands of researchers from universities, companies and other institutions use these capabilities, generally without charge if the results of their research are published.

In addition to these collaborative research mechanisms, companies can access commercially available technologies developed at the national laboratories through standard intellectual property licensing. All laboratories have technology transfer officers. DOE's Office of Technology Transitions maintains an access point to more than 40,000 technologies developed by the national laboratories in an online database, the Laboratory Partnering Service.

Examples of laboratory-company partnerships:

Argonne National Laboratory (ANL) developed engine models and software for computer simulations to provide understanding of how engine parameters interact. In partnership with Caterpillar and Convergent Science, the team conducted simulations of a Caterpillar engine. The result was reduced cost and time for new engine development and enabling adaptation of fuels from new sources and improved fuel economy.

Ames National Laboratory researchers developed a lead-free, drop-in replacement for solder used in electronics. The new technology was licensed to Iowa-based Johnson Manufacturing Co. When regulations on lead precluded its use in electronics, this technology was the basis for broad international adoption.

Sandia National Laboratories (Sandia) and various partners, including Ford Motor Company, agreed to transition Sandia's ducted fuel injection technology from the laboratory to production engines. Developed at Sandia's Combustion Research Facility, ducted fuel injection eliminates 50-100% of the soot from engine exhaust. Engine manufacturers are interested in the technology, in part, because it doesn't require extensive changes to their production processes. It can also be retrofitted onto existing engines.

Creating space to collaborate

One lesson from the creation of the DOE User Facilities is that dedicated, purpose-built facilities are important for effective collaboration leading to innovation breakthroughs. National laboratories are also creating physical spaces tailored to specific laboratory-industry interactions. These facilities are designed to support research, development, and testing for technologies, such as next-generation manufacturing or battery systems. A benefit of these facilities is the opportunity for direct interaction between laboratory researchers and company staff to advance both the laboratory's capabilities and the company's product development.

The Grid Storage Launchpad (GSL) is a new collaboration facility planned for the PNNL campus to advance the next generation of grid energy storage technologies. Within GSL, researchers will validate innovative energy storage materials under realistic grid operating conditions. The facility also provides collaboration laboratory space for researchers and industry experts to accelerate the deployment of these materials and technologies.

The Manufacturing Demonstration Facility (MDF) at Oak Ridge National Laboratory (ORNL) was the first user facility with the DOE Office of Energy Efficiency and Renewable Energy (EERE) as its steward. It was established in 2012 to perform early-stage research and development in advanced manufacturing, including additive manufacturing, carbon fiber development, composites advance machining, roll to roll processing, and digital manufacturing. It currently has more than 180 industrial and more than 50 university partners. One of its notable successes is demonstration of new polymer deposition equipment that prints fiber-reinforced polymer structures that are up to ten-times larger and 2,400 times faster than previously available.

The Advanced Manufacturing Laboratory (AML) is a 14,000 square-foot facility supporting the development of new materials and processes. Lawrence Livermore National Laboratory (LLNL) uses this facility to advance its national security missions. Industry partners develop new products and services. AML was dedicated in early 2020. Partnerships with energy, security, and manufacturing companies were established within the first few month of operations.

Meeting Expectations / Addressing Challenges

The national laboratories have hundreds of ongoing projects with companies at any one time. Each interaction between a national laboratory (a federal entity) and a private sector company, group of organizations, or other non-federal entity is treated as a business transaction to ensure all expectations about the federal investment in the public-private partnership are met. While funding may not always flow between the partners, a clear statement of the work to be accomplished and other relevant conditions is established.

Establishing how the project will be conducted takes time. However, the market challenges each company partner faces are time sensitive. The national laboratories, in partnership with DOE, continually look for ways to provide certainty to the project teams and streamline the startup process. For example, two changes recently initiated by DOE allow the national laboratories simplify project startup with private sector partners. First a Master Scope of Work process has been implemented that allows national laboratories to gain pre-approval for a clearly defined, low-risk activity that will be performed for multiple sponsors. This pre-approval of scope shortens the approval time for each specific project. Second, national laboratories are able to relax the contract terms for a set of predefined low-risk activities.

The Technology Commercialization Fund program has provided an important opportunity to encourage company engagement with the national laboratories. Because a company partner is required, the program directly supports a laboratory's work with a company to address a market opportunity or issue. In this way, it highlights the role national laboratories can serve in addressing key technical challenges for product development, especially for small businesses.

Research in all national laboratory mission areas contributes to technology transfer

Each of the national laboratories has a DOE program office as steward. While these steward relationships establish the major focus and operating environment for each laboratory, they do not limit the range of research and development activities that the laboratory undertakes. As a result, the research and development portfolios for each laboratory are broad. For example, almost all laboratories conduct some level of basic research and many conduct national security research.

A review of DOE's program offices gives a sense of the scope of research and development areas included (see end notes.)

Energy technologies represent a large portion of laboratories' research and commercialization

National laboratories continuously develop new ideas to meet our nation's energy demand. From batteries to lightweight materials to recycled carbon to the next generation electric grid, national laboratory researchers are inventing and engineering new innovations. Laboratory researchers engineer these new concepts into energy systems for vehicles, buildings, and electrical services.

Examples of energy sciences, research and technology:

Two major DOE-sponsored initiatives are underway leading the development of high-performance battery materials. The Joint Center for Energy Storage (JCESR) is a long-term effort creating transformative batteries for transportation and the electric grid. Led by ANL, it includes three national laboratories, fourteen universities, and other research organizations. Private sector affiliates include GE Global Research, General Motors, Dow-Corning and Lockheed-Martin Advanced Energy Systems, as well as industry organizations such as the Electric Power Research Institute.

Battery 500 is a consortium of four national laboratories and five universities. Led by PNNL, this team is focused on electric vehicle batteries with three times the available energy to weight ratio of today's technology. Private sector partners include IBM, Tesla, Livent Corp., and NaatBatt, with project participation by General Motors, Mercedes-Benz and Navitas Systems.

Idaho National Laboratory (INL) formed a partnership with Oklo Inc. to demonstrate a power plant design for use in remote or off-grid locations. It combines a micro-reactor based on small advanced fission technology with integrated solar technology.

Nearly all laboratories engage in fundamental research at some level

Basic and fundamental science is a key part of the national laboratory system's research portfolio. The outcomes of a basic research investigation are expected to be new knowledge and principles about natural phenomena. While these concepts do not generally provide a basis for translation into a company's products and services, the experimental equipment, data acquisition, and control systems required for the experiments many times do represent innovations with market value.

Examples of technology transfer from fundamental research:

The Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory (BNL) is a DOE Office of Science user facility designed and operated to explore the most basic ingredients that make up the universe. At points where RHIC's two opposing beams of heavy ions collide, special high-performance detectors and data collection systems measure and track the released particles. The software that drives RHIC's data systems contains algorithms that prove useful for other challenges – such as managing internet traffic congestion. A local startup company has been formed to commercialize this technology in partnership with BNL.

The Illinois Accelerator Research Center (IARC) at Fermi National Accelerator Laboratory (FNAL) is using electron beam applications to eradicate perfluoroalkyl substances (PFAS.) PFAS are difficult to break down and therefore accumulate in the environment. In partnership with 3M, IARC researchers are searching for economical methods to eliminate these "forever chemicals."

Imagion Biosystems and the Center for Integrated Nanotechnologies (CINT), a DOE Office of Basic Energy Sciences Nanoscale Science Research Center operated by Los Alamos National Laboratory (LANL) and Sandia, have worked together since 2006 on synthesizing nanoparticles. Bob Proulx, CEO of Imagion Biosystems, stated that "the fact that CINT has a user program that allows industry to access the facilities and equipment that, otherwise, would be too expensive for a small company like ours was valuable. The initial work we did with CINT to develop a method to give precise control over the size of the nanoparticle was key for our MagSense magnetic relaxometry technology for the detection of cancer."

Labs engage and support small business needs

The national laboratories have a long-standing role in supporting the needs of small businesses. This support may take one of several forms. First is direct support toward a technical challenge that the small business does not have the expertise to address. Second may be a partnership between the small business and laboratory in developing the company's products. One example of the latter case is a national laboratory partnering with a small business to propose to a federal agency's Small Business Innovation Research (SBIR) program. Third, a small business or startup company may license technology from a national laboratory. In conjunction with the license, a research agreement may be established to ensure full understanding about the licensed technology is transferred to the company's personnel.

DOE has several current and past programs effective in establishing the partnership between a small business and a national laboratory. They include:

Laboratory Partnering Service (LPS) – LPS, operated by DOE's Office of Technology Transitions, was mentioned previously as a source of all patents from DOE national laboratories. In addition, LPS offers companies access to key technical experts at the national laboratories. The LPS user can search for an appropriate expert or user facility. then contact the laboratory to request information and discuss their technical challenge. LPS also includes profile information about the full set of resources available at each laboratory.

Technology Commercialization Fund (TCF) – TCF provides funding to partnerships of national laboratories and companies intending to commercialize laboratory-developed technology. DOE/OTT manages this annual, competitive solicitation of proposals. A cooperative research and development agreement (CRADA) is executed between the partners to enable the project to begin.

Technology Assistance Program (TAP) – Several of the national laboratories have had technology assistance programs that address the technical questions a small business may have. These engagements can be likened to a consulting activity. TAP is intended to address activities in which no new research content or intellectual property is created. Most TAP programs have been funded by national laboratory discretionary funds.

A specific version of the technology assistance was launched in 2020 in response to the COVID-19 pandemic. DOE/OTT provided funding for laboratories to support small businesses with technology needs for addressing the impacts of the pandemic.

Small Business Vouchers (SBV) – DOE's SBV program was created to allow small businesses to call on national laboratory capabilities when technical development was required. In that way, it can be considered to fill the gap between the TAP and TCF programs. SBV is currently dormant and not accepting applications.

This set of small business programs has proven extremely valuable to both the affected businesses and to the national laboratories.

Lab researchers' direct experience with industry enhances technology transfer

Researchers find direct experience with companies through research engagements valuable

Programs that provide exposure to entrepreneurial skills and experiences, co-development with industry, or direct support of small business allow researchers to understand company and market perspectives through direct learning. Not all national laboratory researchers want to become startup entrepreneurs nor move to a company. They are committed to their research priorities at the national laboratory. They do find the exposure to a company's opportunities, challenges, and business model provides a fresh perspective and increases their success in developing new research programs.

The programs mentioned previously also provide this experience. Interactions within TCF and TAP projects provide opportunities for working with a company to address their issues. Requests for advice through LPS provide the opportunity to diagnose how the national laboratory can assist the company. Each of these experiences expand the researcher's perspective.

Entrepreneur training helps broaden and validate researchers' innovation concepts

DOE's Energy I-Corps program is the centerpiece of most national laboratory efforts to expose their researchers to entrepreneurial training. Based on industry-standard practices, it provides exposure to the initial stages of building a business case around a laboratory technology, including direct interaction with potential customers. Since its inception in 2015, 111 teams from eleven national laboratories have participated in the Energy I-Corps program.

The national laboratories have individually augmented the core program with introductory programs that provide a brief exposure to the Energy I-Corps concepts. Its value is to engage more researchers in entrepreneurial training than is possible through the core program alone. In addition, laboratories have created pitch sessions where laboratory researchers gain feedback from investors and startup professionals.

An example of the value of entrepreneurial training:

One of the inventors of the RHIC data collection system mentioned earlier participated in basic entrepreneurial training at BNL. It was through these sessions the researcher became aware of the possibility to apply the high throughput data technology to applications outside of experimental equipment for fundamental physics.

Entrepreneurial leave programs

For some national laboratory researchers, the attraction of a startup company is enticing enough they decide to join one. To support this transition, many of the national laboratories have created entrepreneurial leave programs. These programs must deal with two primary issues. First is establishing the length of the leave and the conditions that must be addressed when anyone moves from a federal entity to the private sector. Second are the residual benefits and commitments, if any, provided to the staff member while on leave.

Of the national laboratories that have implemented entrepreneurial leave, no two are identical. They all do, however, address the core set of issues outlined above.

Recently, the existence of an entrepreneurial leave program has become an important incentive in recruiting researchers. Stated differently, we find the lack of a program to be a disincentive for researchers to join a laboratory – or any other science and engineering organization. This is especially true for early career researchers.

Conclusions

In this testimony, I have outlined three perspectives on how the DOE National Laboratory System uses partnerships with industry to inform our research across broad and diverse mission spaces, to result in positive impact on the U.S. economy. Through direct interactions with companies, universities, federal agency sponsors, and other organizations, national laboratory researchers can better align their research to the future scientific needs and current market opportunities. This continues to keep our nation at the forefront of science and technology.

Some of the programs I've discussed today are relatively new; some are not. They all offer important advantages in translating laboratory technologies to market solutions. For that reason, we in the national laboratory system are committed to supporting them to the extent possible.

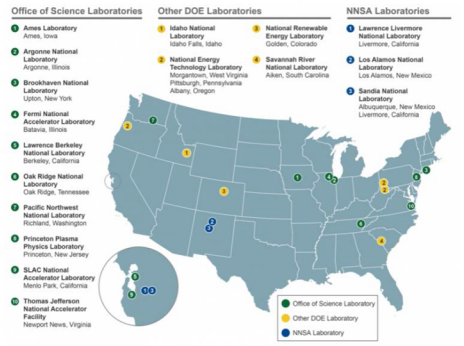
The purposes of this hearing today are well aligned with the needs and opportunities I believe are necessary to continue and expand the economic impact from the science and technology developments generated across the seventeen DOE national laboratories. We look forward to continuing our efforts to help realize that benefit.

Thank you for your attention to these challenges. And, once again, I thank you for the opportunity to testify on this important topic. I would be happy to answer any questions you may have.

Additional Information

National Laboratories and DOE Program Office Stewards

DOE's Office of Science stewards ten national laboratories: Argonne National Laboratory (ANL), Ames Laboratory (Ames), Brookhaven National Laboratory (BNL), Fermi National Accelerator Laboratory (FNAL), Thomas Jefferson National Accelerator Facility (JLab), Lawrence Berkeley National Laboratory (LBNL), Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL), Princeton Plasma Physics Laboratory (PPNL), and Stanford Linear Accelerator Laboratory (SLAC).



Each of the 17 DOE National Laboratories is stewarded by a program office in the Department. The Office of Science stewards 10 of these, ranging from single-purpose laboratories like Fermilab to broad, multiprogram laboratories such as Argonne.

Three laboratories are stewarded by the National Nuclear Safety Administration: Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL) and Sandia National Laboratory (Sandia).

Four laboratories are stewarded by other DOE program offices: Idaho National Laboratory (INL), National Energy Technology Laboratory (NETL), National Renewable Energy Laboratory (NREL), and Savanah River National Laboratory (SRNL).

DOE's mission areas cover the breadth of physical sciences

The 17 national laboratories contribute to nearly all of DOE's mission areas. As a result, the research and development portfolios for each laboratory are broad. A review of DOE's program offices that serve as national laboratory stewards and major program sponsors gives a sense of the areas included:

- Office of Science includes basic and fundamental research in physics, basic energy sciences, biological sciences, environmental sciences, and advanced scientific computing
- National Nuclear Security Administration includes maintaining the stockpile nonproliferation, counterterrorism and counterproliferation, and powering the nuclear navy
- Office of Energy Efficiency & Renewable Energy
- Office of Electricity
- Office of Fossil Energy
- Office of Nuclear Energy
- Office of Environmental Management

Lee Cheatham (PNNL) - *Director, Technology Deployment and Outreach*
lee.cheatham@pnnl.gov Office: 509-375-6597

Lee Cheatham has an extensive track record of leadership in advancing science, technology, and commercialization in the DOE laboratory system, academia, and private industry. He joined Pacific Northwest National Laboratory as Director of Technology Deployment and Outreach in 2017, focusing on industrial partnerships to expand the impact of PNNL's science and technology.

Before joining PNNL, he launched and led Brookhaven National Laboratory's Office of Strategic Partnerships, where he expanded and diversified the lab's research portfolio and oversaw technology commercialization and economic development. He previously served as Chief Operating Officer and General Manager of Commercialization for the 500-person Biodesign Institute at Arizona State University. Before that, Lee served as Executive Director of the Washington Technology Center, connecting businesses with research institutions in the state. Lee began his professional career at PNNL as a computer science researcher and manager, including leading a $40M/year nationwide DOE-industry cooperative research project.

In the private sector, he launched businesses in commercialization consulting and software sales. Notably, he served as Vice President, Worldwide Engineering for a software company serving a majority of US libraries as well as globally.

Lee holds three degrees in electrical engineering: a Ph.D from Carnegie-Mellon University, an MS from Washington State University, and a BS from Oregon State University. He currently serves on the National Science Foundation Director's Business and Operations Advisory Committee.

Chairwoman FLETCHER. Thank you, Dr. Cheatham. Thanks to all of you for your opening statements and for your written testimony.

And we will now move on to our first round of questions. I will begin by recognizing myself for five minutes.

And of course I have many questions but will direct the first to Dr. Reichert. In your testimony, your written testimony, you noted that the participation of underrepresented groups, including minorities and women, have long—have been long-standing issues in the cleantech industry and that incubators have often lacked the necessary resources to engage in meaningful outreach and develop programming to support these groups. I was pleased to read in your testimony that you were seeking out opportunities to partner with organizations that support traditionally underrepresented entrepreneurs in the Houston area as you formalize your plans to expand there. How can the provisions of the *Energizing Technology Transfer Act* be strengthened to support racial diversity among clean energy entrepreneurs? And maybe if you want to answer that, if anyone else wants to weigh in after that, I would appreciate that.

Dr. Reichert, can you hear me?

Dr. REICHERT. Yes.

Chairwoman FLETCHER. Terrific. Do you have thoughts specifically on the *Energizing Technology Transfer Act* and how it can strengthen to support racial diversity among clean energy entrepreneurs?

Dr. REICHERT. Yes. As I mentioned in my testimony, the National Clean Energy Incubator program described in the proposed legislation will be crucial for filling a much-needed gap in cleantech incubator operations support. In normal times, one of the biggest challenges faced by incubators is funding operational costs. And incubators spend a lot of time in survival mode. It's not easy to fundraise to support startups in a challenging area and a challenging funding environment for them. It's hard to imagine adding another set of programming on top of this one. And incubators have often lacked the necessary resources to engage in meaningful outreach and development programming to support DEI (diversity, equity, and inclusion) efforts.

But what I think the government could offer to support programs in this area that I think would more fully integrate diversity, equity, and inclusion into the operations of an incubator are as follows: The government could provide technical support and assistance to help incubators be more knowledgeable about available training and other resources to foster inclusivity.

As well, the government could support workforce development programs such as internships, co-ops, or fellowships that specifically target underrepresented groups for cleantech startups and for cleantech incubators.

The government could incentivize groups already working successfully in this area to partner with incubators that need to get better at this. There's no reason to reinvent the wheel and to take funding away from groups already doing good work. Such programming would help enable an equitable clean energy recovery, ensuring that all of the human capital and talent in the United States that we have to offer is applied to the challenge of climate change.

Chairwoman FLETCHER. Terrific. Thank you so much. Would any of the other panelists like to weigh in on that question?

Ms. STATES. I would if I could. Thank you. And for Washington Maritime Blue, diversity, equity, and inclusion has been a key focus area, including a part of our strategy where we work with the University of Washington students to do a lot of outreach and engagement and really understand how we can improve in this for the maritime and cleantech sector. So we have a youth maritime collaborative where we do have internship programs, and we also provide equity training for those industry partners that are doing the internships. But the key is it's really hard to find the resources to do this. So while we can put the programming together and find the partners, it's the need for the funding to enable these things to happen.

We do have an incubator program and try to encourage as much diversity, equity, and inclusion in those incubators. But, as Emily mentioned, the key is funding and enabling those programs, which I think this legislation really sets up the foundation to do that. Thank you.

Chairwoman FLETCHER. Thank you, Ms. States. I do have one other question for Ms. Wong, and I'm limited on time, so I'll try to ask it very quickly. But, Ms. Wong, in your recent report that you mentioned in your testimony earlier on "Mind the Gap," you mentioned that existing nonprofit foundations that work with the CDC, NIH (National Institutes of Health), Department of Agriculture (USDA) have mobilized to support public-private partnerships to respond to COVID–19. And I'm wondering how an energy foundation might help respond and recover to events and—recover from events like the ongoing pandemic or other national emergencies through enabling partnerships at the DOE. So I have about 30 seconds left if you would share your thoughts with us on that.

Ms. WONG. Sure. And I thank you so much for the question. In fact, some of you may know that there is a Center for Disease Control foundation. They have been very active since the beginning of the pandemic and have raised over $110 million. And if it pleases the Committee I did send earlier an article that's all about public-private partnerships that the CDC has been able to create through its foundation. That's exactly how the Department of Energy could do more work with the private sector is through public-private—or public-private partnerships. And since it's the end of your time, I'll stop there.

Chairwoman FLETCHER. Thank you so much. Thanks to all of you for your insight. I will now yield back my time and recognize Mr. Lucas for five minutes.

Mr. LUCAS. Thank you, Madam Chair. And I want to first turn my question to Dr. Cheatham, and when he has completed his thought, open it up to the panel in general. As I mentioned in my opening statement, I believe that collaboration and coordination between Federal research agencies on pivotal issues like technology transfer is essential to the overall success of the U.S. enterprise. However, I understand that each Federal agency and each area of research may have different tech transfer needs and specific challenges. In your opinion, how can we in Congress best work to sup-

port a long-term, comprehensive science and technology transfer strategy, Doc?

Dr. CHEATHAM. Thank you. Thank you very much for the question. And I appreciate the intention of it to look at broader solutions than we might see in just one agency.

One of the things that I have learned being both in the Department of Energy's system and in my small participation with the National Science Foundation is that there are a number of commonalities between them. And I'll just reference one as an example. Both the Department of Energy and the National Science Foundation certainly have responsibilities for large scientific facilities. These are facilities in the Department of Energy, and NSF does the same sort of thing. There are many—that's just one area where there are many commonalities between the kinds of activities that the Department of Energy's national laboratories take and universities on behalf of the National Science Foundation take. So I think finding ways to share those experiences back and forth could certainly be very helpful.

At the same time, I recognize that there are differences between the national laboratory system and DOE and the other agencies. And I'll specifically reference the universities and the National Science Foundation, one of their primary supportive organizations certainly. We have grown up under different conditions in those, the labs and the universities. With respect to tech transfer, we actually operate under different authority and policy for the commercialization of technology.

And so one of the challenges I'll just, again, point out one perhaps small thing, although for many of what we're seeing it's a big deal. We're facing a very significant shift toward digital technologies as being important for many companies. At our laboratory, we were in the past very much looking at patenting new phenomenon, patenting new devices. We have now seen over the last 15 years quite a shift toward digital technologies. That means software and data.

The ways in which we handle software, for example, in the copyright process is fundamentally different than it is held in the university system. And so those are the kinds of changes that would be looked into, could we understand whether it makes sense to move those, but I just now, in reporting this, we see that many more of our companies are saying we want the combination of a patented technology that I can build into a device and the operating software to go with it, so making sure that those two things can come together for that company without having to deal with multiple different processes could be very helpful. I hope that's helpful.

Mr. LUCAS. That makes sense, Doctor. Anyone else on the panel care to touch on that? Absolutely.

Ms. WONG. Yes. Thank you, Ranking Member. I think that one of the things that I have found to be fascinating about the potential for a Department of Energy foundation is that it can actually work not just with the Department of Energy but it could also work with other agencies. In my research on the other agency-related foundations I found that there are a number of things that the Founda-

tion for Food and Agriculture Research is working on that DOE could also work on.

And so I think a lot of people here know that sometimes agencies can be protective of their turf. Let's just say that. And that includes their budget. And so sometimes it's hard for them to want to engage together on their own. But through a foundation or through two foundations, you could have it be more of a level playing field where the foundations can encourage the agencies to come together around certain challenges or opportunities that they both could work on. So I think that there's an opportunity through the foundation to do exactly what you are talking about, doing more across the science and technology portfolio of all the agencies.

Mr. LUCAS. Absolutely. Anyone else wish to touch on that?

Ms. STATES. Yes, if I could expand just a little. Jetta is absolutely right, and as are you when you talk about the need for the crosscutting partnerships and collaboration. I think one of the keys in developing that long-term strategy is for the enabling environment to make that happen. The DOE foundation can provide that. But getting the different types of players together to work on developing a strategy is critical.

We found that in Maritime Blue that's where we started was developing crosscutting collaboration to—on the strategy focusing on projects, what could we work on together to demonstrate win-win solutions for different entities across different sectors, energy, maritime, transportation. And a good example right now is Department of Energy has partnered with the Economic Development Administration on a blue economy cluster funding opportunity, so just one small example of where that has been able to happen but a foundation can really create that enabling environment for the strategy to do it in a much more organized fashion.

Mr. LUCAS. With that, Madam Chair, my time is expired.

Chairwoman FLETCHER. Thank you very much, Mr. Lucas. I'll now recognize Mr. Lipinski for five minutes.

Mr. LIPINSKI. Thank you, Chairwoman Fletcher. Before I begin, I'd like to ask unanimous consent to enter into the record a letter cosigned by 31 scientific societies, universities, and energy advocates in support of the creation of an energy foundation. If I could do that, Chairwoman?

Chairwoman FLETCHER. Without objection.

Mr. LIPINSKI. Thank you. And thank you for holding this hearing today. This is an issue that I have always been particularly interested in on this Committee, how do we find innovative ways to help transition research findings into new products and services.

And one of the programs that I have championed over the years is National Science Foundation's Innovation Corps, commonly known as I-Corps. This entrepreneurial training program gives researchers experience in customer discovery and fosters skills needed to transition research into the commercial sector.

I know that Dr. Cheatham in his written testimony talks about the value of entrepreneur training. And additionally, Ms. Wong mentions in her written testimony a need for the DOE to pilot, evaluate, and scale innovative ideas and highlighted the Department of Energy's version of I-Corps as a success. The independent evaluation Ms. Wong referred to states findings suggest Energy I-

Corps has very high potential to increase the commercialization of trained PI's (principal investigators') lab technologies.

So I believe that this program, Energy I-Corps, is right for an explicit congressional authorization and expansion, and next week, I'm going to be introducing the *Energy Innovation Corps Act* to do just that. I look forward to continuing to work with this Committee on this and hope to see this bill move forward, along with other important energy tech transfer legislation.

So I wanted to start my questions by asking Dr. Cheatham. You described Energy I-Corps as a centerpiece of national laboratory efforts to expose researchers to entrepreneurial training. Can you share a national lab perspective on how this program has been helpful to your employees' professional development and their success in transitioning research into products and services? Dr. Cheatham?

Dr. CHEATHAM. Thank you very much for the question. And this is an important topic. As you well know, the Energy I-Corps version at DOE is slightly different because of the difference in the requirements, but fundamentally the same as the I-Corps version that came out of NSF. We use it at the laboratories to train, as you mentioned, our researchers.

Let me just give one example that explains this a little bit better. Around Energy I-Corps we at Pacific Northwest National Lab have built a pre—what we call a pre-I-Corps session where we bring in a larger number of pairs of researchers to get them interested. It's really a recruiting technique to see who can go through the whole of the program.

And so the first time we did that last year I said to them at the beginning it was kind of tentative. At the end of it, which is only about a week and a half or 2 weeks later, the amazing changes that had come in those researchers because they had made their calls to companies to find out where their technology could work and where it couldn't. Every one of those had a story to tell about how they were going to change the research in their labs when they got back to that after this because they had learned things that just didn't occur to them from their scientific principles, that the market voice in that has really helped them.

And so, as I said in the testimony, we see an increase in the quality of research because of those kinds of experiences, so we're doing everything we can to promote them.

Mr. LIPINSKI. Thank you. Dr. Reichert, you also indicate in your written testimony that you would applaud the expansion of support for I-Corps. Can you describe the value of this program to your members? Dr. Reichert?

VOICE. Dr. Reichert, you are muted.

Dr. REICHERT. There we go. So the I-Corps program is a wonderful opportunity for laboratory-based potential entrepreneurs to get exposure to both the concept of entrepreneurship, as well as potential customers. And one of the best things about the I-Corps program that I truly support is the customer discovery focus. In I-Corps, there are many, many customer discovery calls, and this is really critical to potential entrepreneurs understanding that in order to develop a product, a technology that's coming out of a laboratory, you need to have a market. And that market needs to be

well-qualified. And this tends to get early stage companies and early stage potential entrepreneurs off to a strong start when they have that customer discovery resource—research at their backs.

Mr. LIPINSKI. Thank you. And I see I'm out of time. I'm going to enter some other questions asked for—enter those into the record and for responses from the other witnesses, but I'd appreciate my colleagues' support. I'd like them to take a look at the *Energy Innovation Corps Act* when I introduce that next week and would appreciate your support.

With that, I thank the Chairwoman, and I yield back.

Chairwoman FLETCHER. Thank you, Mr. Lipinski. I'll now recognize Dr. Baird. Dr. Baird, I see you're on a mobile device. You may be muted.

Mr. BAIRD. How about that?

Chairwoman FLETCHER. Yes, we can hear you now. You are recognized for five minutes.

Mr. BAIRD. Thank you very much, Madam Chair. I'm not actually on this Committee, but I am a Ranking Member of the Research and Technology Subcommittee, so I would like to hear some more about DOE's potential to collaborate with NSF and the N-I-S-T or NIST in support of governmentwide technology transfer initiatives. Dr. Cheatham, I'll start with you. Then, we can move to the other witnesses. And I heard, Ms. Wong, you mentioned agriculture, so I'm particularly interested in that when we get to that point. So, Dr. Cheatham, would you mind discussing DOE's potential to collaborate with NSF and NIST?

Dr. CHEATHAM. Yes, I'd be happy to do that. Thank you very much for your question. One of the things that we realize is that the research community is well-connected and is not overly large, so there's a lot of back-and-forth between them. What we see as we're looking at both of those agencies—let me just start, first, with NIST. One of the things that has happened recently that is affecting technology transfer is the work that the Under Secretary Copan has been doing at NIST on looking toward updates in technology transfer policy and regulations. It's beginning to open some of the channels in that—that allows us to do things I've been talking about and engaging companies, engaging entrepreneurs, and that sort of thing. So we certainly have been in close conversation with NIST on that sort of activity because we believe in the long run it will be better for everyone.

I mentioned a little bit about the NSF activities. Let me instead focus on the key partnerships that DOE labs must have and do have with the universities. Sometimes those are supported by DOE on our side, by NSF on the university side. Again, almost all of the key challenges that we're facing, whether that's batteries or whether it's the electric grid, or whether it's any kind of renewable energy, we really need to have that partnership between the universities and the laboratories. And I mentioned a few in my testimony around the batteries, those are key if we're going to get to the next generation of batteries that are three times more—energy densities three times higher than what we're seeing right now.

So I hope that's been helpful with a few examples. I'm happy to follow up if there are more, so I'll let some of the others speak now.

Mr. BAIRD. I appreciate that answer. And I certainly would agree with you in terms of the need for collaboration between the universities, and the things that are done at the national labs at a basic level are very impressive to me. So I will give the other witnesses the opportunity to make a comment.

Ms. Wong, I think you had something you might mention about agriculture. That's of particular interest to me.

Ms. WONG. Of course. Absolutely. Thank you. So I think that there are a number of things that the Department of Energy can do with other agencies, and I'd like to point out first that, as Lee was saying earlier, the national laboratories already do quite a bit of work across the board in a variety of different technologies. And in fact they do a lot with other Federal agencies, including USDA and NIH.

When I was talking earlier, I had mentioned that there's a Foundation for Food and Agriculture Research, and they have put out a number of very interesting solicitations, some related to, for example, the amount of carbon that could be sequestered in plants and in the soil. And that's something that DOE—the DOE national laboratories actually has quite a bit of experience in, and in fact I think including PNNL, and so there are lots of opportunities for collaboration. So we need to give the laboratories and the universities a platform to work within to bring those kinds of partnerships together. And that's something that I think a foundation can do.

But I think that that's not the only thing. I want to mention also that you had asked about NIST. And NIST has a great program—I'm sure you know about it—the Manufacturing Extension Partnership (MEP) program, and that has strong connections to the private sector. I see that as one of the important programs that the DOE foundation could help support and bring people to, bring entrepreneurs to connect the different dots that are required to move the technology through to commercialization. So that would be another area that NIST and DOE, through the foundation, potentially could work together.

Mr. BAIRD. Thank you. And I see I'm out of time, but, Madam Chair, if the Committee would like to hear from the other two witnesses, that's OK with me. It's up to you.

Chairwoman FLETCHER. Why don't we go ahead—we have several more Members to be recognized, but perhaps we could ask those witnesses to——

Mr. BAIRD. I yield——

Chairwoman FLETCHER [continuing]. Submit their responses in writing.

Mr. BAIRD. I yield back. Thank you.

Chairwoman FLETCHER. Thank you, Dr. Baird. Next, I'll recognize Ms. Stevens. Ms. Stevens, I believe you're muted.

Ms. STEVENS. Can you hear me?

Chairwoman FLETCHER. Yes, we can.

Ms. STEVENS. You can hear me?

Chairwoman FLETCHER. You're recognized for five minutes.

Ms. STEVENS. Great. So, yesterday, the Department of Energy's Vehicle Technologies Office and Advanced Manufacturing Office announced Federal funding for projects across the country that will

support new and innovative advanced vehicle technologies. Companies with an incredible presence in my district received over $21 million to lead these innovative projects in advanced vehicle batteries, electrification, and manufacturing that can be leveraged into millions of dollars more to follow on in private sector investment. Certainly, when we look at some of our moonshot innovations of the 21st century, I believe electric vehicles is right there.

But, Ms. Wong, you spoke in your testimony about the Office of Technology Transitions' role with national labs and facilitating technology transfer and mentioned that laws such as the—authorizes—quote—"authorizes multiple collaboration pathways for the transfer and use of DOE-funded R&D through minimal tweaks to mostly existing policies and programs." Just wondering if you could speak to some of the changes that could be made to better increase the Office of Technology Transitions' engagement with other DOE research labs as we look to be collaborative and crosscutting here.

Ms. WONG. Thank you for that question. That's a fantastic question. You know, one of the things that we could tweak—and actually the *Energizing Technology Transfer Act* allows the Office of Technology Transitions to do, is it provides them a budget, a Technology Transitions program, and I think that's an important thing because, right now, the office doesn't have a lot of flexible funding to try to do outreach to other programs like the Vehicle Technology Office within the Department of Energy to develop potentially, you know, new opportunities to be more innovative in what they could do, so I think that that's something that's very important that is already included in the bill that could be very valuable to building that relationship with other offices.

Ms. STEVENS. Right. And just as Dr. Baird had left off, we play a role with that Research and Technology Subcommittee. I'm the Chair of that Committee. And, as he mentioned, it has jurisdiction over the National Institutes of Standards and Technology. I appreciate your comments there, Dr. Baird, about how NIST could be better leveraged for some of those tech transfer efforts. I personally have worked with NIST on a multitude of manufacturing and supply chain engagement efforts throughout my career and you get firsthand that unique role that they play with the private sector.

Last year, NIST released a report on barriers to and recommendations for improving American innovation and economic competitiveness. The recommendations included expanding Federal partnership mechanisms through nonprofit foundations.

As a sponsor of the *IMPACT for Energy Act*, which has come from Congressman Luján, which would establish a foundation model at DOE to facilitate partnerships with the private sector and tech transfer capabilities, Ms. Wong, how might an energy foundation help respond to and recover from events like the ongoing COVID–19 pandemic or other national emergencies through enabling partnerships with DOE?

Ms. WONG. Well, thank you so much for that question. I think that we in this country and around the world are seeing all sorts of different kinds of activities related to hurricanes and fires. I used to live in Oakland, California, and many people probably saw the rolling brownouts that took place because of the fires that were going on there. It was a crisis, right? Everyone was like we need

new technology, we need to jump on this, and we need to better understand what's going on with our grid. And it occurred to me that there are technologies at a variety of different labs.

One that I know of at PNNL is a kind of analytical program that helps us understand the grid, but it mostly looks at what happens with cybersecurity or hurricanes. It could be adapted for fires. And a foundation, because it's not part of the Federal Government, would be able to act quickly, find funding, and then really support the development of that technology in a crisis like what we're seeing here with COVID–19. So that would be another example where you could use a foundation.

Ms. STEVENS. Great. And with that, I'm out of time, and I'll yield back, Madam Chair. Thank you.

Chairwoman FLETCHER. Thank you, Ms. Stevens. I will now recognize Mr. McNerney for five minutes.

Mr. MCNERNEY. Well, I thank the Chairwoman for this great hearing and I really applaud the witnesses. It's really good information.

I noted that at least two witnesses identified that no one Federal agency is responsible to bring technology from the labs to the market. I developed wind energy technology for 20 years so I know personally about the valley of death.

Ms. Wong, it's great to welcome you back to the Committee, and thanks for calling out my bill earlier in your testimony. Would you reiterate what specific changes the proposed legislation, that we see, would be helpful to empower a single agency for that purpose? In other words, I know you spoke about foundations, but what could we change in the current proposed legislation to empower a single agency to carry out the function?

Ms. WONG. Thank you for the question and it is wonderful to see you. So I think that the Energizing bill does quite a bit already to really help the Department of Energy to really change the culture and change the thinking around getting out of the valley of death, getting through the valley of death.

I think one thing that I would—and I mentioned it in my opening statement—I would really encourage the Committee to look at is the Technology Commercialization Fund, which was authorized in 2005 through this Committee. The current language takes out—as far as I can tell, takes out the requirement for the laboratories to work with the private sector, so the original language said a match from the private sector. And it was important to take out the match requirement because I think that that was too much money to require an outside partner to put into an early stage technology. But by taking out that private-sector piece, it doesn't push the labs enough to engage with the private sector, to understand what those commercialization needs are. So that would be one tweak I would suggest for the current legislation.

Mr. MCNERNEY. OK. Thank you. Dr. Cheatham, throughout the COVID–19 pandemic, Lawrence Livermore National Lab has been working to leverage their expertise to develop related equipment. Can you discuss some of the ways that the national labs have been utilizing technology transfer in the fight against COVID–19?

Dr. CHEATHAM. Thank you. Yes. I can—excuse me. I can mention a few of those. And my colleagues at Livermore have done a great

job in working through those things. But let me start first at a little bit higher level. One of the first things that the Department of Energy did was stand up a National Virtual Biotechnology Laboratory, which in code I think means representatives from each of the laboratories have been meeting regularly, even daily to scour the whole of the laboratory system for which technologies might be appropriate for the challenges that are being faced right now. And so while I don't want to go into that a lot, just to note that there are mechanisms like that that are being used to ensure that we dig into all of the corners in the laboratories to figure out what might be there and what might be available.

One of the other technology areas that we have gotten a lot of requests from companies about is protective coatings. As you can guess, protective equipment is a big deal, and several of the laboratories have developed different versions of protective coatings that are—they're essentially hydrophobic, meaning they shed water very easily and other things. And so we're beginning to see companies pick those technologies up out of our laboratory. We have some—there—I know there are some at Brookhaven, and I know there are some at Livermore. I believe that Sandia has one of those technologies, too. So those are the kinds of technologies, even though they're slightly different, are certainly being picked up and moved forward. So at least that's a couple of answers. Is that—if that offers what you were looking for.

Mr. MCNERNEY. Sure. You know, I just wanted to give out a shout out to the labs. You mentioned the co-benefits, Dr. Cheatham, of the lab's researchers, as well as businesses when they partner together. What are some of the challenges that the labs face in partnering with private companies?

Dr. CHEATHAM. Well, I have to say, as anxious as the researchers are and the companies are to engage with each other, we do have to do some education, if nothing else, in just language because, as you—I think people well know, the context of being in the private sector—I spent a number of years at a software company and a startup company of my own, and I've been in the lab for 20 years. The perspectives that are taken on both of those are different and so a lot of the times folks in my group, for example, who are commercialization managers are spending time helping each of the companies and the researchers understand what the other means. What are they really looking for and that sort of thing. And so just the simple things I'll say right up front about can we communicate, once that barrier is through, they can run and do what they need to do.

Mr. MCNERNEY. I believe it. Well, thank you. I have some more questions for the record and I will yield back.

Chairwoman FLETCHER. Thank you, Mr. McNerney. I'll now recognize Mr. Foster for five minutes.

Mr. FOSTER. Well, thank you. And I guess I'll start with Dr. Cheatham. First off, I greatly appreciate your expertise here today but given your role as the Chair of the National Laboratory Working Group on Tech Transfer. You know, as someone who started a company that actually escaped the valley of death and is doing quite well, as well as having spent 25 years at a national laboratory, you know, this is a tough nut to crack.

So from your experience serving in that role, what are the major challenges that national laboratories face in engaging in tech transfer activities? And also, you know, would the programs that are authorized in the bills that are under consideration today help address any of these challenges?

Dr. CHEATHAM. I think—well, to answer your second question, I think some of them certainly will. The four that I called out address the—I think—I tend to think of this process as a chain of events that we have to go from creating a new idea through several steps to a company that is actually selling something in a marketplace and making a difference. And there are places along each one of those that you clearly have experienced on your own. I used to like to say, by the way, that buried in the valley of death, if you look down in that chasm, they're the bones of companies that just couldn't get across, so I'm happy to hear——

Mr. FOSTER. Sure. Yes.

Mr. CHEATHAM [continuing]. That you did get across. But at each of those stages there are different things. The programs like Energy I-Corps we've discussed really help our researchers move through, but one of the questions is how do we identify the number of companies that understand the laboratory system and the number of companies that our laboratory commercialization managers have personal access to is smaller than it should be, and so one of the things that we're looking at trying to do as a network of laboratories is to figure out what we can do to make those connections for the companies that might need our technologies much easier.

One of the things that we've done I'll briefly mention in this is to engage, I'll say, third-party almost intermediaries. Some of these times they're investment funds. Sometimes they are accelerator activities. But these are organizations that are either private sector or—and sometimes they're nonprofits, but they have the connections that they know where the companies are and they know where the entrepreneurs are, and they know how to get into the laboratories. And we found that very beneficial.

We're working with—I'll just mention one we're working with in Seattle right now. It was spun out of an investment fund there. And that's becoming very useful because they know which companies want—they can look at our technologies and help us make the match. I think that's one of the key challenges that each of us in the national laboratory system faces.

Mr. FOSTER. One of the interesting models if you look internationally is the government actually retains an equity stake in some of the startups. Israel is sort of famous for doing this. And, you know, I often daydream that if we had retained—if the Federal Government had retained a five percent stake in Google as we basically paid for all of the R&D that led to Google, and then were able to retain that in the Federal research and development budget, that we would be in a very different fiscal situation for research in this country. And so has there been ever serious discussion along those lines of an equity model in this country?

Dr. CHEATHAM. There is. In fact, we do have the ability to take equity. And we at Pacific Northwest Laboratory have done that. We've got a startup company that's in Philadelphia right now building medical equipment that we have a small equity stake in.

The challenge that we have is making—not making that too big. And the reason is because, as a public entity, we cannot seem to be—seen to be in competition with the private sector. And that means if we get too much of a controlling stake in any company, we essentially then have a say over what they're doing to an extent that is outside for what's intended for a public entity.

So yes, we have those tools, yes, we use them judiciously. There are some limitations. And I think in some cases those are probably reasonable. But it's an interesting conversation we go through each time that we try and do that.

Mr. FOSTER. All right. And you're right about the potential for conflict of interest in that model. And do you get to—does the laboratory get to keep the money if the company becomes a homerun, or does it go back to the Federal taxpayer?

Dr. CHEATHAM. Well, it goes back to the—I'll say it goes back to the Federal taxpayer in that we keep it and reinvest it in building the capabilities of the laboratory. So in some ways the royalties stream into all of the laboratories is intended to make reinvestment. We do that through the development of new technologies, creating new capabilities, creating new equipment, and all of that sort of thing. And so, yes, all of that is reinvested through the laboratories based on the outcomes from each of those licenses.

Mr. FOSTER. And so the first time you create a unicorn there will be an interesting discussion of the split of the profits from that.

Dr. CHEATHAM. There will be.

Mr. FOSTER. Yes, thank you very much and I yield back.

Chairwoman FLETCHER. Thank you, Mr. Foster. I'll now recognize Mr. Casten for five minutes.

Mr. CASTEN. Thank you, Madam Chair. Thank you to all our speakers. I have to start by confessing that I've been sitting here doing internet searches on Dr. Reichert because of your background at A.D. Little. I'm trying to figure out if we overlapped. I worked at Arthur D. Little from '97 to '99, and then a lot of my colleagues went off to Tiax. And I suspect we could probably play the name game and spend a little time together.

I mention that because to some degree everything that's old is new again. The—when I was a young consultant in the 1990's, we did a lot of—the dot-com bubble had just popped. There was all this money flooding into fuel cells and batteries and microturbines and we would go and help these companies develop their business plans, sometimes they're equity investors, and did a lot of work for DOE as well trying to recommend policies on exactly this topic.

And as you know, Dr. Reichert, the beauty of being a former consultant is you only remember the predictions you made about the future that came true and you ignore all the rest because that way you bat a thousand in hindsight.

But one of the—one of the charts we regularly used to pull out was that the S-curve for technology adoption in the energy generation space at a point from proof of concept to 50 percent market penetration is always about 15 years. It's true for wind, it's true for combined cycle, it's true for every new energy technology. And yet we get all these companies that said that they were going to be, you know, fully operational in six months to meet their equity projections.

And the reason is just that if you have a capital-intensive low-margin industry, the investors tend to be conservative. They don't want to write big checks when they know they can't get their money back in seven years unless somebody else has already operated that technology for 7 years continuously. It's super easy to develop—get the money to raise money for an app. It's really hard to get the risk around for energy technologies.

And so I want to start just by asking Ms. Wong, although other—the rest of you may have thoughts on this. What do we still need to do to improve on the technology transfer program for capital-intensive industries in commodity spaces? Because it just seems to me like we still think that this is going to be like developing the next Google, and we lose sight of the fact that these are big dollars, and it takes a long time to get done. How can we—what can we do better in those capital-intensive commodity industries?

Ms. WONG. That is a terrific question, and you've outlined the problem that I think all of us on the panel see every day. And I would echo what a lot of the other panelists have said, which is that we need to better connect our researchers to the people that are actually commercializing the technologies, the manufacturers, the customers that are deploying those technologies because, as you said, they are very risk-averse, and they do not trust a startup that's coming with them with this new widget and they say, oh yes, we can create this, we can manufacture it, no problem. We need to make sure that those entrepreneurs and those private-sector companies are coming together and sharing their understanding of what is going on in the R&D world and what is needed in the private-sector world to commercialize the technology.

This is one of the reasons why we think that the DOE foundation idea is so important is because it provides a platform, a neutral platform for those different entities in the innovation cycle to come together. And particularly——

Mr. CASTEN. If I could just interrupt and I don't mean to be rude but I'm watching the time here, and let me reframe the question a little bit. If you've got a technology like a cutting-edge new fuel cell, like a cutting-edge new wind turbine where a commercial-scale product is a—pick a number, $50 million investment, the issue isn't connecting people to research. It's where can the private market go out and say is there anything at commercial scale that has been operating for a long enough period of time.

And it seems to me that every time the Federal Government has tried to do that, we get beat up for the mistakes, witness Solyndra, because they are such high-profile, they're such high-dollar projects, and as a result, it just feels to me like we get skittish. So how can we better bring those projects forward because these assets, they cost a lot of money. They're big bets and if they're seen as big bets for the taxpayers, they're even bigger bets for the private sector proportionately.

Ms. WONG. Sure. I think that the demonstration program that is in the bill where they're trying to have better oversight and implementation of those larger projects that are more than $50 million could be one of the ways to do that. I know my colleague Farah has done some research on that so maybe she'd like to comment on that.

Mr. CASTEN. Well, I think I am about out of time so unless the Chairwoman will allow Farah to comment, I would welcome any of your comments in writing afterwards because I loved all your expertise, but we're out of the five minutes here, so thank you and I yield.

Chairwoman FLETCHER. Thank you, Mr. Casten. And yes, we would appreciate receiving those comments for the record.

And I will now recognize Mr. Lamb for five minutes.

VOICE. Ms. Fletcher, Mr. Lamb had to step away for a moment.

Chairwoman FLETCHER. Yes.

VOICE. He will be back shortly.

Chairwoman FLETCHER. I see that. Why don't we skip over Mr. Lamb and go to Mr. Beyer and then we'll come back to Mr. Lamb.

VOICE. And it looks like Mr. Beyer has left the hearing. We'll see if he's coming back in.

Chairwoman FLETCHER. OK. Well, I think Mr. Beyer was our last Member so why don't I do this. I'll open it up for quick—oh, I believe Mr. Luján has just arrived.

VOICE. Yes, he is connecting in at the moment.

Chairwoman FLETCHER. Yes, as soon as he's connected I'll recognize Mr. Luján and then we'll go back to Mr. Lamb.

VOICE. Mr. Lamb has returned.

Chairwoman FLETCHER. Okay. Well then, we'll go back to the regular order and I recognize Mr. Lamb for five minutes.

Mr. LAMB. Thank you, Madam Chair. Sorry for my delinquence there. I want to thank all of our witnesses for their patience.

I can't see you on my screen right now, but I had a question for Ms. States if she is still with us.

Ms. STATES. I am, yes. Thank you.

Mr. LAMB. Yes, thank you for your contributions. And I think you're—so I come at the maritime issue from a slightly different angle just because in my area in western Pennsylvania we're in an inland waterway port, one of the largest and busiest in the country, so our maritime issues are little bit different but similar in the technologies that we need to adopt.

And I think your emphasis on hydrogen is really important not only for maritime but for a number of other industrial applications as well, whether it's trucking, which you also kind of mentioned. But I think there's going to be applications in steel and many other things that are relevant out here.

So I was wondering if you could just say a little bit more about the challenge of really building something large, you know, not just researching it but building, you know, the type of plant that would be needed to create hydrogen and pipe it to where it needs to be. And I know your process you were talking about was a little bit different, but can you give us some more detail on how we can improve that not just with this bill but over time, how we actually get things like that built? Because a lot of the emphasis today has been about getting technology out of the lab, which is good, but I think we need to work a lot harder on getting these really large scale, hard-to-build infrastructural elements out of the lab as well. Go ahead.

Ms. STATES. Yes, thank you very much for the question. And actually I'll—in my answer I will touch on that and the question from

Representative Casten as well in how you can do these large investment projects better. The—using this example of this hydrogen-at-scale project that we have proposed, it is really a systematic approach that involves all the different connected players on the waterfront in order to enable a project that crosses both transportation, energy, maritime, utility, and chemical industry to bring them all together to make it happen.

The technologies are at different readiness levels, so the Federal Government investment is needed to de-risk those—where the technology readiness level is too early to really get private-sector investment, but there are aspects where we are getting private-sector support for some of the cost share because there are, for example, some good savings for the utility in the model we put together.

So the way we're doing that is by not just using hydrogen in a traditional way in a fuel cell but having a systematic approach where clean electricity, hydropower from a local utility is being used to generate hydrogen when it's off-peak, when they have excess generation. The hydrogen is converted to formic acid. Formic acid is a liquid hydrogen carrier. It already exists in the fuel chain. It's easier to store, to move, has easier permitting pathways because it already exists in this form.

Then PNNL has a technology—and, excuse me, OCO Inc. is the technology for that, a newer commercialization company. PNNL has the technology for re-formation of the formic acid into hydrogen, and then it's used on a fuel cell. When we go further, the fuel cell is mounted on a truck bed so that it can be a mobile fuel cell that goes directly to where a ship is berthing and can plug in that ship, instead of using its diesel engines, and could use the fuel cell. So it saves the utility the infrastructure cost of having to build a substation at every single berth.

So by having this integrated systematic approach, you bring different players together for different win-win scenarios at different technology readiness levels and make good things happen for all the different players. But it's really difficult to do that in traditional funding opportunities, so that's the key, is having a flexible model like a Department of Energy foundation that can enable that and having those connected systems between all these different players through regional partnerships like Maritime Blue to make it happen.

Mr. LAMB. And it sounds like also, though, making sure that if there is an Energy Department foundation, that it has dedicated resources and funding streams not only to sort out some of the basic science ideas themselves but to the financing of these larger-scale projects.

Ms. STATES. Absolutely, yes. That public funding is essential for de-risking the early stages of this, getting through that valley of death, and bringing together the partners to be able to work in that systematic approach. So having the funding stream from the public side to be able to leverage the private side is key.

Mr. LAMB. Thank you very much. And, Madam Chair, I yield back.

Chairwoman FLETCHER. Thank you, Mr. Lamb. And I will now recognize Mr. Luján, who has joined us and is joining the Com-

mittee this afternoon for this hearing. Mr. Luján, if you have questions, I would like to recognize you for five minutes.

Mr. LUJÁN. Chairwoman Fletcher, thank you so very much for this important hearing and for the recognition. And before I begin, I have a unanimous consent request. I have a letter from Greentown Labs and a letter from 31 organizations, including academic and professional society companies and experts that speak to the importance of H.R. 3575. And I ask unanimous consent that they be entered into the record.

Chairwoman FLETCHER. Without objection, so ordered.

Mr. LUJÁN. Thank you, Madam Chair. And, again, thank you to everyone for being part of this important hearing today—important hearing on legislation that would promote clean energy and help enable an economic recovery. While all of us represent constituents who are struggling to make ends meet, to pay rent, and provide for their families, I'm encouraged by the increased attention of putting people back to work by building a more sustainable and resilient economy.

The COVID–19 pandemic has made clear the role that our scientists, engineers, entrepreneurs, and innovators play in addressing our Nation's most pressing challenges, and I am proud of New Mexico's contribution to our research mission led by two world-class national laboratories, Los Alamos and Sandia National Labs. Acting on these bills today means that more ideas and innovations from our best and brightest scientists will make it into markets, provide jobs, and improve our quality of life.

The *Energizing Technology Transfer Act* would drive clean energy technology commercialization in our national laboratories and across the DOE, including two bills that I authored that are being considered. First, the *Leveraging our National Labs to Develop Tomorrow's Technology Leaders Act*, which strengthens the Department of Energy's Lab-Embedded Entrepreneurship Program, which utilizes national laboratories to train and develop the next generation of tech entrepreneurs to meet the broader challenges and the needs facing our communities.

Now, the legislation also includes my bipartisan *Promoting Small Business Innovation through Partnerships with National Labs Act of 2019*, which allows small businesses to gain access to premier facilities at the labs, spurring innovation and stimulating the culture of private-public collaboration.

Lastly, H.R. 3575, otherwise known as the *IMPACT for Energy Act*, would establish a DOE-affiliated nonprofit foundation to engage with the private sector to raise funds and leverage expertise that supports the research, development, demonstration, and commercial application.

So I just want to thank the Chair for all of her work today and for everything that she has been doing.

Now, Ms. Wong, in response to the COVID–19 pandemic, the National Institutes of Health activated their foundation to bring together experts, develop a coordinated research response, and speed up development of a vaccine and treatment options. Could a foundation at the Department of Energy help DOE better respond to the crisis of emerging issues?

Ms. WONG. Yes, sir, and thank you so much for your leadership on these issues. It is wonderful to see you here again on the Committee.

Yes, absolutely. We had talked earlier about how important the Centers for Disease Control Foundation has been in developing a more than—or fundraising more than $110 million for the pandemic since the beginning of the year, and so a DOE foundation could do the same thing, reacting to emergencies that happen across our country when it is necessary to bring new technology to market to identify public-private partnerships that could encourage quick action.

The example I gave earlier actually I was personally impacted by was when I was living in California during the brownouts last year where hundreds of thousands of people lost power, everyone was talking about how we need new technologies to monitor the grid. And the fact is is that we have a lot of technologies that monitor the grid, but we don't use them to understand how they would be impacted by fires.

And so the example I was giving is that PNNL has a particular technology that, if the foundation existed, it would be able to act quickly to help develop that technology in a way where we could use it to better understand what happens in a brownout when there's a fire and could we prevent it. So there are lots of examples like this, and so I think, yes, a foundation could act quickly to address these major issues.

Mr. LUJÁN. And, Dr. Reichert, in a letter of support for a DOE foundation, you wrote you believe in a nonprofit foundation at the U.S. Department of Energy. Can you elaborate on why private-sector engagement from the Department is important for commercialization and how a foundation would uniquely support incubators such as Greentown Labs? You're muted, Emily.

Dr. REICHERT. Thank you so much for the question. As Ms. Wong has made clear as well, the importance of engaging the private sector and investment community in cleantech innovation can't be understated. We work with about 50 corporate partners, and we have direct experience in engaging them, and this has resulted in investments, commercial pilots, joint development agreements, licensing agreements for our incubated startups. And we're really glad to see the vision for the DOE foundation, and I think DOE's engagement with the private sector will much better inform research conducted by the labs and academic institutions.

It's important for DOE to understand what barriers exist in the market to the deployment of new technology, and one way to get this information into their hands is with engagement with the private sector. Also understand that the foundation will be able to help incubators and startups work with national labs, and this could be beneficial for our companies because, often, they don't have access to the top-of-the-line equipment that they might access at a national lab.

Finally, I understand the foundation will be re-granting organizations, and this means organizations like Greentown Labs will be able to receive funds from the foundation to implement our programs to continue to connect the private sector with startups and

with researchers so that we can all look forward to a clean energy future.

Mr. LUJÁN. Thank you so much. And, Madam Chair, thank you again for the time and the Members of the Committee for allowing me to ask some questions today on some important legislation. And, again, these are all bipartisan ideas. I hope we can move them together and get these signed into law. Thank you and I yield back.

Chairwoman FLETCHER. Thank you so much, Mr. Luján. We're so glad to have you join us today and glad for your work on this important topic.

Given that we've had several Members who had hoped to get additional questions answered or additional insight, I'm going to go ahead and do a short second round of questions for folks. So if you have an additional question, maybe send me a note in the chat. I'll try to go through, but I want to make sure I get to everyone for the second round.

My—I'm going to go ahead and recognize myself first for five minutes in this round two of questions, and my question is for Ms. Benahmed. As we've discussed in various ways today, the COVID–19 pandemic has really exposed people and our abilities and our Nation's economy. Individuals and companies have been experiencing the pandemic and the effects of the pandemic in different ways, in many ways. Can you share with us what your research shows about the biggest challenges facing clean energy startups specifically from this health crisis and share your insights about how the United States can better compete with international competitors on clean energy in the wake of the pandemic. I would really like to get your thoughts on that.

Ms. BENAHMED. Sure. Thank you for the question. So small businesses like clean energy startups are most vulnerable to economic downturns. They don't have cash reserves built up, shareholders they can lean on, access to low-cost borrowing like corporations, and in many cases they haven't matured into profitability yet. Also, many in the venture capital (VC) community are holding onto their cash and refraining from making new investment decisions. In fact, VC investment activity has plummeted 25 percent since the pandemic hit. As Dr. Reichert mentioned, clean energy entrepreneurs face challenges in raising capital as they struggle through project delays, supply chain disruption, and determine how to keep staff on payroll.

Clean energy startups are more at risk during the global pandemic than ever before. We don't want to roll back the good progress we've made, and we cannot let our past net zero emissions be halted by the economic impacts of the pandemic. We need emergency relief measures for clean energy startups now, and we need policies that can help them grow in the long-term.

How we can better compete, so, currently, nine other countries invest more in energy R&D than the United States as a share of GDP. For example, China invests .1 percent of its GDP to the United States' .04 percent. The way that we can better compete with other nations is to advance clean energy innovation. As I mentioned during my testimony, this can be done through substantially increasing Federal clean energy R&D, committing to clean energy

demonstrations, and expanding tech transfer programs like the ones included in the *Energizing Technology Transfer Act*. Commercializing the clean energy technologies we need for climate change and making them cost-competitive will give us an advantage on the global stage. Thank you.

Chairwoman FLETCHER. Thank you very much, Ms. Benahmed, for your insights. I appreciate it. I'm going to yield the remainder of my time and give the opportunity to some of my colleagues. So going back in order of who I believe is still participating, if you have additional questions or if you would like to ask any panelists for answers to a previous question, I believe the next person is—that's present is Dr. Baird. Dr. Baird, you're recognized for additional questions——

Mr. BAIRD. Well, thank you, Madam Chair. And I would like to yield the other two witnesses the opportunity to address my question about the DOE's potential to collaborate with NSF and NIST as it relates to the things that they do. And I'll start with Ms. States and then Ms. Benahmed. Does that work?

Ms. STATES. Yes, thank you very much for the additional time to address that. I think one example I'll point out with NIST is, again, the Manufacturing Extension Partnerships, but that local presence and how important that is. When Maritime Blue was just getting started, we actually worked with our local NIST MEP Impact Washington, as the fiscal agent for the new Maritime Blue nonprofit startup, so they were critical in helping us in dealing with the different colors of money for the funding that we had to put together to make Maritime Blue work and for connecting us with some of the needs of the industry in the manufacturing sector, the shipbuilding community, and others. So that's just one example for NIST MEP.

And I'd like to also go beyond and say that really it cuts across so many different government agencies, especially when you start talking about the transportation, electrification of transportation, use of hydrogen, so it crosses into the maritime, energy, and many others, which means Department of Transportation. We've looked at funding opportunities from both MARAD, the Maritime Research Administration, and the Federal Transit Authority and how do we electrify vessels, ferries, and have new modes of transportation.

We have worked with Department of Commerce Economic Development Administration, which I mentioned had a partnership with DOE to have a specific funding opportunity for the blue economy clusters to provide funding for just the type of thing that Maritime Blue is working to enable, including spreading our incubator and acceleration programs for commercialization.

And so it—and NOAA (National Oceanic and Atmospheric Administration) —and I can keep going. There are so many connection points when it comes to the blue economy across our Federal Government sector that really there's many opportunities for collaboration if we can just have the right enabling environment through something like the DOE foundation to allow those different colors—those different Federal agencies to come together and allow different colors of money to come together for the investments that we need.

Mr. BAIRD. Well, thank you. The Chairlady has my clock running, so I wanted to hear from the others, too, so, Farah, do you want to make a comment, and then, Dr. Reichert, you later?

Ms. BENAHMED. Sure. I'll just say that there are opportunities for agencies to work together to share best practices. When it comes to small business innovation research program, DOE could work with the National Science Foundation in implementing their model. Currently, at DOE SBIR program managers are scattered across the department, and more often than not the SBIR program isn't their highest priority. And NSF runs a really great SBIR program, so I would say—I would encourage the collaboration between the two to ensure that they're optimizing their program.

Mr. BAIRD. Dr. Reichert?

Dr. REICHERT. Yes. So I think I would add to Ms. Wong's comments about the Manufacturing Extension Partnership through NIST. I think that is a very unique resource. It exists in every State. We have worked quite closely with the Massachusetts Extension—Massachusetts MEP, and that organization has provided an amazing network of connections to manufacturers that enable clean energy startups to get their technology to scale. Often, they are needing everything from machine shops all the way to low-volume production. And without that critical resource, these clean energy startups would have a difficult time to find those manufacturers that are in every State but are often hard to find if you're a startup and your main tool to do searching is Google.

Mr. BAIRD. Thank you. Madam Chair, I was looking up refreshing my memory on formic acid a minute ago and it—hydrogen, carbon [inaudible] and hydrogen, but, you know, I know this is a high-level discussion, but ants and stinging nettles, that's the toxic material in those issues. So it's interesting to watch science make advancements from those stages to where we are in the discussions we're having here. So, with that, I've got about 22 seconds. I thank you, Madam Chair. I appreciate the opportunity.

Chairwoman FLETCHER. Well, thank you very much, Dr. Baird. I will now recognize Mr. Casten for five minutes additional questions.

Mr. CASTEN. Thanks so much, Madam Chair. I want to pivot a little bit away from the stuff I asked last time and a question for Ms. Wong and Ms. States. Over the last decade, you know, really at the leadership of Congress, the Department of Energy has made an effort to support a whole bunch of initiatives to accelerate commercialization of various clean energy technologies from ARPA-E (Advanced Research Projects Agency—Energy), Office of Technology Transitions, various Hubs, consortia, the Manufacturing Institute. Can either or both of you help us understand what value would a nonprofit energy foundation contribute that can't be accomplished through those existing programs?

Ms. WONG. Jennifer, I know that you from the private sector have a lot to say about this so I'll let you.

Ms. STATES. OK. I didn't want to take your time, but thank you. I think the enabling environment through a nonprofit foundation is really what is key. By having an entity that is outside the individual silo of the Department of Energy and some of the different administrative burdens that private and especially small private

companies have a really hard time in complying with for both DOE and other Federal funding opportunities, it can create that flexibility that's needed to really deploy the funding opportunities faster and in a collaborative fashion that might come from multiple agencies. It can deploy those funding opportunities in a way where you have come together to understand better what the need is from the commercial side so that you can have a systematic approach that might cut across several different entities even within DOE.

One technology office like the Vehicle Office, which could be a place for vessel electrification, it doesn't necessarily fit because they don't deal with vessels. But it comes from the Battery Office or MARAD, as I said. So having a foundation where you can bring those different players together to structure these opportunities in the right way to have the flexibility and the systematic approach I think can really enable this to happen.

We have amazing staff at our Federal Government agencies that do their best with the bureaucracies that they have to be under, but having that foundation structure to enable faster deployment, more connected deployments I think is really going to help make DOE's investments work even better.

Mr. CASTEN. Ms. Wong, anything to add there—disagree, have a different perspective?

Ms. WONG. You know, I think I would just add that—and I only heard a little bit of it, Jennifer, so sorry if I, you know, repeat. But I think the idea is that you're bringing all these different parts of the innovation ecosystem together in a neutral platform where they can really understand what's going on across the innovation cycle and to pull those technologies to the market where there's real demand. And that's something that DOE doesn't—can't do as quickly as an outside organization can do because of some of the constraints related to accounting and budgeting and budget lines. And so I think that those are really important things.

And Congress has acted over and over again when there are these kinds of constraints to create these quasi-governmental organizations. There are nine different foundations that exist that are similar to what DOE would have with the IMPACT legislation. So, this is not a new issue for many of the government agencies.

Mr. CASTEN. Well, I guess—and all that makes—all that both makes a ton of sense and makes me a little bit sad. The—you know, if essentially what you're saying is that the nature of the bureaucracy in the organization means we need something nimble on the outside, is there—can either of you contemplate—and I'm not recommending this. It's just an open-ended—is—are there ways that we could change DOE processes so that we wouldn't have to depend on these outside groups, or is it—is this just the nature of large-scale bureaucracies? Are we just stuck with this and this is the right way to go forward?

And I don't mean that as a leading question. I'm just genuinely curious. If I was still CEO of a company as I was before and I had this problem with my own organization, I'd be thinking about how to make the organization more nimble, not how to find an outside partner.

Ms. WONG. I think it's a really good question and I think that there are things that the Department of Energy can do and that's

why I'm very supportive of the energize bill because it does make a lot of really important improvements on what's going on within DOE. But DOE is not the private sector and they don't commercialize technology. It is the private sector that commercializes technology. And you want them to be a part of that conversation. That's an important part of how technologies make it to the market, so I think that even with the broad bureaucracy, you still need to engage the private sector in that conversation and that's what a lot of these programs are focused on doing.

Mr. CASTEN. Thank you. And I see my time is up. I really appreciate your thoughts, and I yield back.

Chairwoman FLETCHER. Thank you, Mr. Casten. Thank you to all the Members for your great questions and really, thank you to all of our witnesses for your insights and your answers and your participation in this virtual event today.

I just want to make sure that I let you know how helpful it is for us in reviewing this legislation, as well as thinking ahead about the other things that we can do in our Subcommittee, in our Full Committee, and of course throughout the Congress to advance these initiatives. So thank you so much for your testimony here today.

The record will remain open for two weeks for additional statements from Members, for any additional questions that the Committee may ask of the witnesses, and for anyone, if you need to supplement your answers, we'll be happy to take that for the next two weeks.

But at this point the witnesses are excused and the hearing is now adjourned.

[Whereupon, at 3:25 p.m., the Subcommittee was adjourned]

Appendix I

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Ms. Jetta Wong

Written Response of Ms. Jetta Wong: Questions for the Record
Hearing on "From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future"
Subcommittee on Energy, House Committee on Science, Space, and Technology
August 18, 2020

Questions submitted by Representative Weber, Ranking Member, Subcommittee on Energy, Committee on Science, Space, and Technology

I am interested in learning more about the DOE non-profit organization that the IMPACT for Energy Act hopes to establish. More specifically, since this legislation authorizes "such sums as are necessary" for this work, I'd like to get an idea of what the establishment and operation of this foundation will cost.

- Can you shed light on this issue or give a cost estimation?

Answer: The report that I co-authored with David Hart from the Information Technology and Innovation Foundation, "Mind the Gap: A Design for a New Energy Technology Commercialization Foundation," published in May 2020 describes a vision for the concept of a non-profit foundation outlined in the IMPACT for Energy Act. This report provides a detailed discussion of how other congressionally authorized agency-related foundations function, their common characteristics including some commentary on budgets and operational expenses. In this answer I will summarize some of that information and explain how the ETCF would be established and continuously funded with both federal appropriations and external funds.

Congress should provide ETCF a one-time appropriation of $30,000,000 to work with DOE and jump-start the foundation. This would establish the foundation's credibility, help attract high-quality staff, and leverage substantially larger contributions from nongovernmental donors. This follows the approach that the Congress took when it established the Foundation for Food and Agriculture Research. FFAR was established in 2014 to increase agricultural R&D in association with the U.S. Department of Agriculture (USDA). Congress sought to strengthen American leadership in this field by "supplementing USDA's basic and applied research activities." Congress acted on this vision by giving FFAR two large multiyear appropriations totaling $385 million, while making clear this investment should not "offset or allow for a reduction in the appropriated dollars that go to [USDA] research." For every tax dollar it has received, FFAR has been able to raise $1.25 from about 300 co-funders from philanthropy, academia, and industry. Following the model of FFAR, all ETCF expenditures made from an appropriation would have to be cost-shared to leverage funds from private and philanthropic partners.

To maintain its activities, ETCF would receive funding from donors with a range of interests that align with the DOE's mission. One of ETCF's key fundraising strategies should follow the FNIH model, seeking support from groups of private companies that share an interest in a cross-cutting national challenge or a regional energy innovation ecosystem. FNIH was established in 1990, and has raised over $1 billion from individuals, companies, and charitable foundations over its history. While this funding is critical to individual projects at NIH, what makes FNIH stand out is its ability to create and sustain R&D collaborations that focus on national challenges identified by NIH researchers and partners in academia, industry, and philanthropy. By bringing these stakeholders together they accelerate pathways to new

drugs, tools, and clinical trials, leveraging nongovernmental funding to accomplish mutually agreed upon public-sector priorities. Programs for the ETCF would follow a similar collaborative co-funding process.

Funds raised from outside donors for programs and activities are critical to achieving the mission of the foundation, yet often do not cover all operation expenses. Most agency-related foundations also receive a modest annual federal appropriation of between $500,000 and $1,250,000 to supplement their administrative costs. An annual appropriation of $3,000,000 would allow ETCF to avoid a constant scramble to fund core staff and certain operating expenses, which neither corporate nor philanthropic donors are usually willing to support.[1] The annual appropriation is somewhat higher than those for other federal agency-related foundations because ETCF would need not only a core staff for development and program work, but also consultants in diverse technology areas across its very broad scope. We envision ETCF's activities growing over time, and its budget becoming similar to those of other agency-related foundations. Their annual budgets range from just a few million dollars for the FDA-related Reagan-Udall Foundation to almost $500 million for the Department of Defense-related Henry M. Jackson Foundation for the Advancement of Military Medicine.

The $3,000,000 modest appropriation would not cover its full operational expenses. Based on a review of the existing foundations' operational costs, ETCF's would be significantly more than the appropriation. The FNIH in 2018 had 14 percent of its $65,000,000 budget, or around $9,000,000, dedicated to management and fundraising.[2] The National Park Foundation in 2015 had an annual budget of about $109,000,000 and spent about $17,000,000 on Supporting Services including general and administrative and fundraising activities.

For ETCF to be successful, its staff would need to have exceptional technical and business expertise as well as a strong understanding of DOE and the philanthropic sector. The staff would have to command respect and trust across the energy innovation ecosystem. To enlist such a staff, the foundation would need to pay competitive salaries requiring significantly more than the annual $3,000,000 appropriation.

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[1] Maria Di Mento, "Five CEOs of Wealthy Foundations Pledge to Do More to Help Charities Pay Overhead," Chronicle of Philanthropy, September 2019, https://www.philanthropy.com/article/5-CEOs-of-Big-Foundations/247063.

[2] Foundation for the National Institutes of Health, "FNIH: 2018 Annual Report," 2018.

Question submitted by Representative Lipinski, Committee on Science, Space, and Technology

The current Energy I-Corps program focus on employees at the National Laboratories.

- Do you see a benefit in expanding this program to other DOE-funded researchers, including students, or other DOE-funded entrepreneurs, such as recipients of SBIR and STTR awards?

Answer: Yes, there is an opportunity to expand a version of Energy I-Corps to other DOE-funded researchers including recipients of SBIR and STTR awards. I suggest DOE, working with NSF, re-examine the original Innovation Corps model which trains university-affiliated innovators. They should also review the lessons learned from the two third-party evaluations of Energy I-corps to create a similar program focused on energy challenges of researchers at universities and other research institutions.[3] When the Energy I-Corps program was established in 2015, DOE and the labs undertook an extensive process to understand NSF's I-Corps program. This included sending some DOE lab researchers through an existing NSF I-Corps training program. With the assistance of these lab researchers, NSF, and Steve Blank the originator of Lean LaunchPad (the platform which I-Corps is based) DOE created the Energy I-Corps curriculum. It is based on I-Corps, but with some adjustments. The curriculum addresses some of the unique challenges that National Laboratory scientists face when working to commercialize federally-funded laboratory technology. It would not be appropriate to send a DOE-funded university scientist through a program specifically developed for the National Laboratories, but a new program would be immensely valuable. DOE sends more than $900 million directly to universities through academic research grants annually, and to my knowledge, very little of these funds go to entrepreneurship or to the commercialization of technology.

The Energy I-Corps program shares some similarities with the NSF I-Corps program.

- Do you think it would be beneficial for DOE to coordinate more closely with NSF, and any other federal research agencies that may have entrepreneurial and commercialization training programs?

Answer: Yes, DOE should be encouraged to coordinate with NSF and other federal agencies. It should share what it has learned about entrepreneurship at federal laboratories and it should look to understand best practices developed at other agencies and laboratories. DOE, through its Office of Technology Transitions, should participate fully in the Interagency Workgroup on Technology Transfer. This group has coordinated technology transfer and commercialization activities for the Federal government since it was established in 1987 by Executive Order 12591. This group has been reconstituted over the years and its activity was the backbone of President Obama's 2010 Presidential Memorandum: Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-Growth Businesses.

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[3] Energy I-Corps Program: Year 1 Process and Impact, prepared by Research Into Action Inc., NMR Group Inc., and 360 Innovation LLC, November 2016. https://www.energy.gov/sites/prod/files/2018/02/f49/energy_i-corps_program_year_1_process_and_impact_evaluation_0.pdf
Second-Year Impact Evaluation of the U.S. DOE Energy I-Corps Program, prepared by Research Into Action Inc., NMR Group Inc., and 360 Innovation LLC, March 2018.
https://www.energy.gov/sites/prod/files/2018/12/f58/impact-eval-energy-icorp-03-2018.pdf

Are there any other considerations Congress should keep in mind when directing DOE to expand the Energy I-Corps program?

Answer: As Congress considers an authorization for an expanded Energy I-Corps program there are three areas for examination which could strengthen U.S. competitiveness and enhance the country's innovation support infrastructure.

1) The first consideration should be flexibility for DOE to experiment with different Energy I-Corps models. While technology transfer has been a mission of all federal laboratories since the passage of the Stevenson-Wydler Technology Innovation Act of 1980, few DOE laboratories have been charged by their program offices to engage in this critically important space. The Energy I-Corps program is relatively young and there is much to be learned about how this model supports the commercialization of federally-funded technology. DOE should be encouraged to pilot different versions of the program.

2) DOE currently funds the operations of Energy I-Corps with a small amount of funding through the Office of Technology Transitions to develop the curriculum, recruit program instructors and industrial mentors, and help assemble laboratory teams from across the DOE National Laboratory complex. Then individual units within DOE fund teams to go through the program. As of November 2019, the offices of Energy Efficiency and Renewable Energy, Fossil Energy, Nuclear Energy, Environmental Management, as well as the National Nuclear Security Administration have funded teams. While this expansion across DOE shows its wild success, it also implicitly demonstrates an underlying issue with the program. Each one of these offices only fund teams within the narrow scope of the office's congressional appropriation. Therefore, potentially innovative technologies are not getting funding because they do not fall into a specific appropriation line. OTT should receive an additional appropriation to fund cross-cutting technology teams within the DOE mission space.

3) Similar to (2) above, DOE National Laboratory researchers that would like to go through Energy I-Corps but are working on a technology outside the mission space of DOE (i.e. agriculture or health) have no support from DOE to participate in the program. Other agencies should be encouraged to support DOE Laboratory teams focused on other agency technologies and interested in going through Energy I-Corps.

Responses by Ms. Jennifer States

Questions for the Record - Response of Jennifer States

Director for Blue Economy, DNV GL Energy and Maritime North America

Project Director, Washington Maritime Blue

Submitted to the

U.S. House of Representatives,

Committee on Science, Space and Technology,

Subcommittee on Energy

August 18, 2020

Hearing on

From Lab to Market: Accelerating our Progress

Toward Economic Recovery and a Clean Energy Future

July 17, 2020

DNV GL Energy USA, Inc.
1400 Ravello Drive, Katy, TX 77449
www.dnvgl.com

Washington Maritime Blue
3303 Monte Villa Parkway, Suite 340
Bothell, WA 98021
www.maritimeblue.org

Question from Representative Weber, Ranking Member, Subcommittee on Energy, Committee on Science Space, and Technology:

> I am interested in learning more about the DOE non-profit organization that the IMPACT for Energy Act hopes to establish. More specifically, since this legislation authorizes "such sums as are necessary" for this work, I'd like to get an idea of what the establishment and operation of this foundation will cost.
>
> - Can you shed light on this issue or give a cost estimation?

Answer from Ms. States:

The establishment and operation of a new, agency-affiliated non-profit has two essential funding categories: operational funding and programmatic funding.

Operational funding is needed for hiring of technical staff that can navigate cutting across the different sectors and technologies areas to ensure successful management of the organization and its numerous partners. Operational funding is needed annually, and the consistency and commitment of this funding over the long term is key.

As a newer non-profit organization, Washington Maritime Blue has faced the biggest challenge in finding and bringing in operational funding. State and Federal government agencies, foundations and even private sector dollars typically target investments towards programs and projects that align with their missions. Operational dollars are the most difficult to find, and yet the most critical to ensure the stability and functionality and success of the organization.

Recruiting and maintaining the technical staff with cross-cutting capabilities requires consistent, reliable and sufficient operational budget allocations. The staff need to know how to work across government (federal, state, local) entities, research communities, as well as foundations and private sector companies. Knowledge of different technologic areas is needed to pair the research capabilities with private sector gaps for commercialization. Highly capable staff with ability to implement programs successfully will be key to attracting partners and private sector dollars. Therefore, it is more important that Congress put investment towards operational budget.

For the programmatic funding, a one-time allocation is needed for initial structuring and implementation of programs and projects. Programmatic funding would be deployed for specific focus areas to implement projects that can accelerate innovation and advance commercialization of clean technologies. With the Congressional investment in quality staffing for the DOE Foundation, they will be in the best position to work with partners to structure the programs and funding opportunities. These investments can be deployed

from the DOE Foundation to states for them to lead regional projects, demonstrating on-the-ground success.

But to be successful, the independent and non-profit nature of the Impact for Energy Foundation is essential to reduce bureaucracy and enable structures that work for regional project deployments that leverage public-private partnerships and investments. As I described in my written testimony, I have heard many frustrations expressed by my private industry partner companies and colleagues in trying to do business with the Department of Energy. Solicitations are organized by technology office, while many industry demonstrations need to take an interconnected systems approach for the business case to succeed. The bureaucracy of applying for and dealing with Federal opportunities is often described as "not worth the cost of doing business". Examples range from mismatched cost share requirements, to hair splitting in designating eligible entities, to required time recording on an hourly basis, to the burdensome reporting requirements and changes in expectations from different offices. The Impact for Energy Foundation offers a new model that can facilitate collaboration, leverage public-private investments, and allow for a systematic approach to challenges that integrates capabilities across technology types and entities.

ITIC's "Mind the Gap" report[1] recommends $3 million for annual operational funding, and a one-time appropriation of $30 million over three years to establish the track record and secure additional funding commitments for programmatic funding. These recommendations were made before the onset of our current pandemic and resulting economic crisis, and additional investment is warranted at this time. State and local budgets have been depleted in responding to the crisis, and the economy is not on a trajectory to replenish these funding sources in the short term. The need for Federal support is even more important now.

The COVID-19 crisis has demonstrated the need for rapid response and collaboration across diverse entities. Critical new research, innovations and deployments are being fast-tracked to hasten the medical and economic response. But no one government entity has been able to act fast enough, or on its own, to address the rapidly evolving situations. Due to COVID-19, we need to fast-track the initial investments in the Impact for Energy Foundation and move faster than originally anticipated to deploy projects on the ground in our regions. These initial public investments will establish the track record needed for establishing public private partnerships and attracting private dollars for aggregated and leveraged funding going forward.

As a private sector representative, our industry customers are facing a critical need to accelerate innovations for difficult to decarbonize sectors such as shipping and fishing vessels. In addition to the International Maritime Organization's carbon reduction

[1] *Mind the Gap: A Design for a New Energy Technology Commercialization Foundation*. Jetta L. Wong and David M. Hart, Information Technology & Innovation Foundation (2020). https://itif.org/publications/2020/05/11/mind-gap-design-new-energy-technology-commercialization-foundation

ambitions, Maersk, Shell, and many other key industries in the shipping sector have committed to net-zero operations by 2050. This means that we need action now for investment decisions that are currently being made. In DNV GL's recent *Ports as Green Gateways* webinar[2], Maersk stated that they have only two and a half years before they reach a critical decision point on which zero-emission fuels and technologies they will deploy for their fleet of 750 vessels. Newbuilt ships last up to 25 years in seawater, and the advanced design to build cycle takes time. Rapid acceleration is needed to advanced fuels such as hydrogen and achieve innovations for battery and fuel cell technologies as fast as possible to meet the industry's needs.

As Shell detailed in their *Decarbonising Shipping* report this year[3], the shipping industry consumes 3.3 petawatt hours (12 exajoules) of energy annually[4]. The energy required to power shipping for one year would be enough to power New York City for over 60 years[5]. In addition to technologies such as propulsion systems and storage solutions that need to be developed; transitioning the world's fleet to a new source of energy will take a huge effort to build out the necessary infrastructure. A recent study by the University Maritime Advisory Services estimates that 87% of the $1.65 trillion cost to decarbonize shipping by 2050 will need to be dedicated to creating supply and bunkering infrastructure[6].

These numbers demonstrate the scale of the challenge, as well as the tremendous economic opportunity for the U.S. to be part of the $1.65 trillion in global investments that are needed. But as Joshua Berger, founder of Washington Maritime Blue, stated in his testimony to Congress earlier this year:

> "Industry, ports and communities cannot do it alone. If we are to achieve the IMO's targets to have zero-emission shipping by 2050, it will take an organized federal approach, and the right strategic capital investments by Congress, to support the millions of existing jobs in the maritime sector and create the next generation of workforce to make that a reality."[7]

We are facing a critical need and opportunity and to accelerate the commercialization of clean energy technologies. We need to embrace this opportunity for both economic and

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[2] *Ports as Green Gateways: Navigating Waterfront Decarbonization. Lee Kindberg: Director, Environment & Sustainability, Maersk Line/Maersk Agency USA. DNV GL. (2020)* https://www.dnvgl.com/power-renewables/webinar/registration/ports-as-green-gateways-webinar.html

[3] *Decarbonising Shipping, All Hands on Deck. Industry Perspectives.* Shell, Deloitte. (2020). www.shell.com/DecarbonisingShipping

[4] *Sky Scenario,* Shell (2018) https://www.shell.com/energy-and-innovation/the-energy-future/scenarios/shell-scenario-sky.html

[5] *Electricity Outlook*, Energy Committee of the New York Building Congress (2017)

[6] Aggregate investment for the decarbonisation of the shipping industry, UMAS (2020)

[7] Testimony of Joshua Berger, Governor's Maritime Sector Lead, Washington State Department of Commerce Submitted to the House Committee on Transportation & Infrastructure. Subcommittee on Coast Guard and Maritime Transportation. Hearing on "The Path to a Carbon-Free Maritime Industry: Investments and Innovation" January 14, 2020.

environmental reasons: to reduce emissions, as well as to create well-paying clean energy jobs to propel the U.S. from the current economic crisis.

Thank you for your time and consideration.

* * *

Responses by Ms. Farah Benahmed

House Committee on Science Space, and Technology

"From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future"

July 17th, 2020 Hearing

Farah Benahmed, Former Climate and Energy Policy Advisor, Third Way

Questions submitted by Representative Weber, Ranking Member, Subcommittee on Energy, Committee on Science, Space, and Technology

Q1. I am interested in learning more about the DOE non-profit organization the the IMPACT for Energy Act hopes to establish. More specifically, sine this legislation authorizes "such sums as are necessary" for this work, I'd like to get an idea of what the establishment and operation of this foundation will cost. Can you shed light on this issue or give a cost estimation?

A1. According to ITIF's report, titled "Mind the Gap: A Design for a New Energy Technology Commercialization Foundation," by Jetta Wong and David Hart, a one-time appropriation of $30 million is requested to establish the organization and kickstart its activities. Moving forward, the foundation would fundraise and leverage funds from private and philanthropic partners. However, an annual appropriation of $3 million would help cover admin and operating costs, as these important funds are rarely included within private grants. Find the report here.

Questions submitted by Representative McNerney, Committee on Science, Space, and Technology

Q2. While the energy sector saw incredible job growth over the past decade, the distribution of that growth has not been equitable. Can you speak more to what Congress can specifically do to ensure that clean energy programs and their benefits – both environmental and financial – are inclusive and available to everyone?

A2. While I am not an expert on this topic, Congress should direct the Department of Energy to commission a task force of experts to review active and upcoming programs and make specific recommendations to ensure they are equitable and inclusive. It is also important for legislation to require programs to be built and managed in such a way that is beneficial for low-income and minority communities. For example, appropriations language for an upcoming FOA for a technology area can specifically request applications from minority business owners. Lastly, Congress should prioritize Department of Energy entrepreneurship and training programs for low-income and minority communities to provide them with more opportunities to grow and establish a career within the clean energy sector.

Responses by Dr. Emily Reichert

August 18, 2020

Representative Lizzie Fletcher
Chairwoman, Energy Subcommittee, House Committee on Science, Space, and Technology
c/o James Green, James.Green@mail.house.gov
2321 Rayburn House Office Building
Washington, DC 20515

Dear Chairwoman Fletcher,

Thank you for the opportunity to show my support for the U.S. Department of Energy's technology transfer activities, and the role these activities play in accelerating the economic recovery from the current COVID-19 pandemic. It was a pleasure and an honor testifying before your subcommittee in July on commercializing clean technologies for a cleaner, more resilient future.

I have included the questions submitted for the record by Members of the Committee, along with my respective answers below. Should you or the Committee have any further questions regarding my initial testimony or follow-up answers, please do not hesitate to contact me.

Again, it was a pleasure meeting you virtually and testifying before your subcommittee. On behalf of the entire Greentown Labs community, we hope that if you are ever in the Boston area, you and your staff will come by and visit us. Once we open the Greentown Labs Houston location next year, we would be honored to provide you with a tour. Thank you again.

Sincerely,

Emily Reichert Ph.D., MBA
Chief Executive Officer
Greentown Labs

U.S. House Committee on Science, Space, and Technology, Subcommittee on Energy
July 17, 2020 Hearing: "From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future
Questions for the Record Submitted to Representative Lizzie Fletcher, Chairwoman, Subcommittee on Energy

QUESTIONS SUBMITTED BY REPRESENTATIVE WEBER, RANKING MEMBER, SUBCOMMITTEE ON ENERGY, COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

Q1. I am interested in learning more about the DOE non-profit organization that the IMPACT for Energy Act hopes to establish. More specifically, since this legislation authorizes "such sums as are necessary" for this work, I'd like to get an idea of what the establishment and operation of this foundation will cost.

- Can you shed some light on this issue or give a cost estimation?

A1. Thank you for the question Representative Weber. I do not have direct knowledge of the proposed estimated cost for the DOE Foundation, but I can shed some light on the importance of this foundation and its ability to be flexible with funding.

Flexible funding is very rare to come by as most grants include a minimal amount for overhead/operational costs, and generally come with multiple strings attached. From the perspective of an incubator, almost all of our costs are operational and the resources and programming we are able to provide are strictly tied to our startup member's ability to pay for membership. With COVID-19, incubators and startups alike are experiencing a decrease in funding while operating costs stay the same.

Incubators provide the physical space for startups to grow their business and create their first prototype. Greentown Labs has an 88% survival rate for our startup members, and with our expansion to Houston and opening a facility there, we expect the same results. But opening a new facility in a different state is always challenging, and will be more so during the current pandemic. *I believe flexible funding to work with on-the-ground organizations and a one-time appropriation to launch the foundation are essential to sustain and increase the resources and organizations that support startups.*

One of the greatest struggles cleantech startups face is creating connections with valuable investors and potential private sector partners. These connections and relationships are absolutely essential to the success of cleantech startups. These

connections spur commercial pilots, joint development agreements, licensing agreements, and direct investments. Additionally, startups generally find that once they have worked with federal or state governments, and/or have launched a pilot program with private sector partners, they not only understand the market for their innovative tech, but also experience a form of validation for deeply engaging with national institutions and large private sector companies.

Furthermore, startups themselves are always in need of extra funding and resources. When startups are spun out of an academic institution, they generally lose access to the physical resources offered by a university, such as advanced lab equipment, access to peer-reviewed scientific papers, and the built-in community of research and like-minded peers. Greentown Labs, and other incubators, attempt to bridge this resource gap with onsite offerings, but the majority of the onsite resources for startups are private sector sponsored or donated via cultivated local relationships. And while Greentown is fortunate to have a robust academic and research community within the Boston-area, there are other parts of the country that lack this access to highly technical, and expensive, resources.

Lastly, first-time entrepreneurs rarely have business, HR, communications, etc. experience or training before creating their company. A common request Greentown Labs receives from our startup members is the ability to offer more trainings and seminars on topics related to those above. It is currently challenging to continue to accommodate these requests due to limited funding, exacerbated by the pandemic. Fully funding a DOE foundation would help chart a path towards short-term recovery and long-term resiliency for cleantech startups and incubators alike.

U.S. House Committee on Science, Space, and Technology, Subcommittee on Energy
July 17, 2020 Hearing: "From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future
Questions for the Record Submitted to Representative Lizzie Fletcher, Chairwoman, Subcommittee on Energy

QUESTION SUBMITTED BY REPRESENTATIVE LIPINSKI, COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

Q1. Thank you for sharing your thoughts about the importance of the customer discovery training components of the Energy I-Corps.

- Are there any considerations Congress should keep in mind when directing DOE to expand the Energy I-Corps program?

A1. Thank you for the question Representative Lipinski. When Congress directs the DOE to expand the Energy I-Corps program, based on the experience of our entrepreneur community, there are a few things that should be kept in mind.

Existing strengths of the program:

- Awareness building for potential laboratory-based entrepreneurs
  - Exposure to the concepts of entrepreneurship and customer discovery
- Focus on *customer discovery* and the opportunity for entrepreneurs to find their market, or adapt to meet the findings they acquired from customer discovery
  - Customer discovery and understanding of "product-market fit" are much-needed, key first steps for early-stage companies

Areas to consider adjustments to the program:

- Prerequisite participation as an introduction to Energy I-Corps
  - Preparing startups for the I-Corps program by having teams participate in an NSF I-Corps short regional course at a university
- Integration with the overall NSF I-Corps community
  - Sharing best practices and new materials
- Consider increasing support post program
  - Including connecting to the ecosystem, how to keep progressing, etc.

U.S. House Committee on Science, Space, and Technology, Subcommittee on Energy
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In summary, strengthening and maintaining the bridge between academia and launching an entrepreneurial venture is of vital importance and I support its continuation and expansion.

Responses by Dr. Lee Cheatham

House Committee on Science, Space, and Technology

"From Lab to Market: Accelerating our Progress toward Economic Recovery and a Clean Energy Future"

Dr. Lee Cheatham, Director, Technology Deployment and Outreach, Pacific Northwest National Laboratory

Questions submitted by Representative Weber, Ranking Member, Subcommittee on Energy, Committee on Science, Space and Technology

I am interested in learning more about the DOE non-profit organization that the IMPACT for Energy Act hopes to establish. More specifically, since this legislation authorizes "such sums as are necessary" for this work, I'd like to get an idea of what the establishment and operation of this foundation will cost.

- Can you shed light on this issue or give a cost estimation?

Response: It is my understanding that DOE is currently administering the actions needed to evaluate and potentially create the non-profit organization that may be authorized under the IMPACT for Energy Act. Since this is an item that is being considered and possibly pursued by DOE, I do not, nor does PNNL, have sufficient knowledge, information, or background on the potential DOE non-profit organization to provide accurate details regarding its creation, costs, or funding opportunities.

Questions submitted by Representative Lipinski, Committee on Science, Space and Technology

Thank you for sharing your perspective on the value of Energy I-Corps for Pacific Northwest National Laboratory.

- Are there considerations Congress should keep in mind when directing DOE to expand the Energy I-Corps program?

Response: Thank you for your question. Participation in DOE's Energy I-Corps program has proven to be an important experience for many National Laboratory researchers. Since its inception in 2015, 111 teams of Lab researchers have completed the program. These teams of researchers, entrepreneurial leads, and industry mentors identify potential market pathways for their lab-derived technology. Eleven PNNL teams have participated with technologies ranging from materials processing for advanced manufacturing to electric grid control and evaluation to special-purpose catalysts and polymer materials.

We see positive impacts in two primary ways. First, for those that have entrepreneurial aspirations to create a company, Energy I-Corps provides the encouragement for, and background to support, a solid launch of the startup. This is also a natural pathway for lab-developed technology to have economic impact. Second, for those that will not launch a startup, the engagement with market forces and private sector considerations increases the impact of their future research. The experience of answering market-based questions about a technology's value may lead to a career of developing and improving technologies that can have impact in the marketplace.

Based on these positive outcomes, I believe that maximizing the exposure of national laboratory researchers to the Energy I-Corps program specifically, and entrepreneurial training and experiences more broadly, is important and valuable.

One way we have extended the experience at PNNL is through a "Pre-Energy I-Corps" program. This introductory program gives our researchers and entrepreneurial leads a taste of the Energy I-Corps

experience, without requiring a full commitment of time and energy to the program before researchers may feel ready to "take the plunge."

The full Energy I-Corps experience is a substantial time commitment for someone with a full research portfolio. Researchers are told to plan for the program to take 50-75 percent of their time for 9-10 weeks. The Pre-Energy I-Corps programs instead provide an introduction that requires only about 10 hours of class time and another 10-15 hours out of class, over a three-week period. The programs give participants a view of the full Energy I-Corps expectations, allowing them to determine if it is right for them. Especially since most national laboratory staff do not ultimately leave their laboratory to launch a startup, this is an efficient way to train a much larger group of researchers than is possible in through the full Energy I-Corps program.

Many of our fellow National Laboratories have also implemented similar "Pre-Energy I-Corps" programs with success, and I believe that expanding a pre-program like this would provide an effective and efficient way to broaden entrepreneurial training for National Laboratory researchers and ultimately further enhance the impact of National Laboratory research and development.

Appendix II

Additional Material for the Record

LETTER SUBMITTED BY REPRESENTATIVE DANIEL LIPINSKI

July 15, 2020

The Honorable Eddie Bernice Johnson
Chairwoman
Committee on Science, Space, and Technology
2321 Rayburn House Office Building
Washington, DC 20515

The Honorable Frank Lucas
Ranking Member
Committee on Science, Space, and Technology
2321 Rayburn House Office Building
Washington, DC 20515

The Honorable Lizzie Fletcher
Chair
Subcommittee on Energy
Committee on Science, Space, and Technology

The Honorable Randy Weber
Ranking Member
Subcommittee on Energy
Committee on Science, Space, and Technology

Dear Chairwoman Johnson, Ranking Member Lucas, Chairwoman Fletcher, and Ranking Member Weber:

The undersigned organizations want to express strong support for creating an Energy Technology Commercialization Foundation (ETCF). The creation of ETCF is consistent with H.R. 3575 and its companion bill S. 2005 – the IMPACT for Energy Act as well as the leading recommendation from the Information Technology and Innovation Foundation in its May 2020 report *Mind the Gap: A Design for a New Energy Technology Commercialization Foundation*.

As a nonprofit foundation, the ETFC would channel private-sector investments to help support the creation, development and commercialization of next generation energy technologies at the Department of Energy (DOE). This type of foundation would help capitalize on the federal government's investments in clean energy research and development by attracting private sector investment and partnership, as well as philanthropic donations. Given today's complex energy challenges and growing international competition, viable solutions often require multiple partners in both the public and private sectors. The ETCF would enhance collaboration and partnerships between researchers from the federal government, universities, industry and nonprofit organizations.

In particular, the ETCF would pool resources to support innovative teams from industry, universities, national laboratories, and incubators to develop new energy technologies. The ETCF would leverage its connection to DOE to connect innovators with world-leading facilities, instrumentation, and experts at the 17 DOE national laboratories and DOE-funded research universities. The ETCF's sole mission would be to bring to market the most promising energy technologies, while DOE can continue to focus on innovative research, development, and early demonstration activities and building and maintaining national lab scientific infrastructure.

The United States is a world leader in discovery science and early-stage research but it still faces significant challenges and barriers in moving new energy technologies from discovery to commercialization and deployment. This gap in the nation's energy innovation ecosystem will stall progress in meeting decarbonization goals, creating the jobs of the future, and maintaining U.S. competitive advantage relative to China and other countries aggressively pursuing market share in new energy technologies.

Modeled after the successful Foundation for the National Institutes of Health (FNIH) and other congressionally-mandated agency-affiliated foundations, the ETFC would complement DOE investments in cutting-edge research and help bridge the gap between innovative but unproven prototypes and successful commercialization and penetration of new technology into the market. An ETCF would also help unlock and guide the untapped intellectual property held at DOE-funded national laboratories and research universities. Since it began its work in 1996, FNIH has raised more than $1 billion dollars for the agency. Additionally, the Veterans Administration, Food and Drug Administration, the Centers for Disease Control and Prevention, and the Departments of Defense and Agriculture also receive support from foundations that were established by Congress. We agree that it is time for DOE to have a foundation of its own.

By providing a new potential funding stream for research and improving relationships between the public and private sectors, the ETCF would help accelerate innovation, strengthen the U.S. economy and bolster our global competitiveness.

Thank you for your leadership and dedication to improving America's scientific enterprise.

Sincerely,

Algae Biomass Organization
American Association of Physicists in Medicine
American Association of Physics Teachers
American Astronomical Society
American Chemical Society
American Chrystallographic Association
American Institute of Physics
American Physical Society
American Society for Engineering Education
Association of American Universities
Association of Public and Land-grant Universities
AVS – The Society for Science and Technology of Materials, Interfaces and Processing
BPC Action
BRITE Energy Innovators
Carbicrete Inc.
Carbon Upcycling
The Center for Climate and Energy Solutions
The Council of Scientific Society Presidents
GE Research
GridWise
High Noon Advisors
Information Technology and Innovation Foundation
Jefferson Science Associates, LLC
Los Angeles Cleantech Incubator (LACI)
OSA—The Optical Society
Purdue University
Stony Brook University
Southeastern Universities Research Association
Third Way
United States Nuclear Industry Council
Washington State University

LETTERS SUBMITTED BY REPRESENTATIVE BEN RAY LUJÁN

GREENTOWNLABS

444 SOMERVILLE AVE.,
SOMERVILLE, MA 02143
888.954.6836
hello@greentownlabs.com

July 19, 2019

Ben Ray Luján
Assistant Speaker of the United States House of Representatives
Attention: Office – % Levi Patterson levi.patterson@mail.house.gov

Re: Impact for Energy Act

Dear Congressman Luján,

As the largest cleantech incubator in North America, we at Greentown Labs are delighted to support the ***Impact for Energy Act***. I write today on behalf of our organization, to express my sincere support for the creation of a non-profit foundation that can increase access to private sector funding, accelerate commercialization, and convene thought leaders from the energy industry and train tomorrow's workforce.

At Greentown Labs, we've learned first-hand how challenging it can be to start and commercialize a cleantech company in this economy. Finding funding, talent and customers can be very hard for entrepreneurs without the right third party organizations acting as connectors and supporters. Even with support from universities, accelerators, and incubators, we believe additional action is required to galvanize the resources of the private sector towards energy innovation.

Specifically, we believe a non-profit foundation managed by the US Department of Energy can ensure market-based solutions are developed and commercialized. Our startups fail most often due to the lack of product market fit. With the right conversation between private sector actors convened through this foundation, we believe clear innovation needs can be articulated and shared from corporate customers to the innovation community increasing the likelihood of startup growth and success.

With a stronger signal from corporate customers and more capital deployed through this foundation, we believe our sector can attract even more talent to invent and deploy these critical technical and business model solutions. We know that without a strong belief that their careers can thrive in this sector, our nation's best talent will not apply themselves to the climate and energy challenges we must solve. We would like to see this foundation help tackle this problem.

I'm excited to see the positive impact the Impact for Energy Act will have on the innovation community. Thank you for your time and consideration.

Sincerely,

Emily Reichert
Chief Executive Officer
Greentown Labs

July 15, 2020

The Honorable Eddie Bernice Johnson
Chairwoman
Committee on Science, Space, and Technology
2321 Rayburn House Office Building
Washington, DC 20515

The Honorable Frank Lucas
Ranking Member
Committee on Science, Space, and Technology
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The Honorable Lizzie Fletcher
Chair
Subcommittee on Energy
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The Honorable Randy Weber
Ranking Member
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Committee on Science, Space, and Technology

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American Association of Physicists in Medicine
American Association of Physics Teachers
American Astronomical Society
American Chemical Society
American Chrystallographic Association
American Institute of Physics
American Physical Society
American Society for Engineering Education
Association of American Universities
Association of Public and Land-grant Universities
AVS – The Society for Science and Technology of Materials, Interfaces and Processing
BPC Action
BRITE Energy Innovators
Carbicrete Inc.
Carbon Upcycling
The Center for Climate and Energy Solutions
The Council of Scientific Society Presidents
GE Research
GridWise
High Noon Advisors
Information Technology and Innovation Foundation
Jefferson Science Associates, LLC
Los Angeles Cleantech Incubator (LACI)
OSA—The Optical Society
Purdue University
Stony Brook University
Southeastern Universities Research Association
Third Way
United States Nuclear Industry Council
Washington State University

ARTICLE SUBMITTED BY MS. JETTA WONG

Why Public-Private Partnerships Strengthen Our Public Health Response

By Amy Tolchinsky | July 1, 2020

The coronavirus pandemic has shown us how important it is that the public and private sectors join together during an emergency response. The different sectors all have their own expertise and resources that when united have a more powerful effect. During this time, we have seen uncommon partners collaborate to make a stronger impact where we need it most—saving lives. The CDC Foundation's President and CEO Dr. Judy Monroe recently participated in a workshop hosted by The National Academies of Sciences, Engineering, and Medicine titled "Public-Private Partnership Responses to COVID-19 and Future Pandemics."

Dr. Monroe was joined by Rebecca Martin, PhD., director of the Center for Global Health (CGH) at the Centers for Disease Control and Prevention (CDC) for this important discussion about the public-private partnership (PPP) response during the COVID-19 pandemic and the need to adapt a broader global health security agenda to address future pandemics. Pandemics are a universal problem and ultimately affect everyone. The objective of this workshop was to look at PPP pandemic responses through a new lens to determine how they have made a difference in the past globally and how we can use PPPs to save lives in the future.

The workshop session focused on how intermediary organizations, governments, and the private sector are working together to develop much-needed practices that will help us guide public health practitioners. For instance, Dr. Monroe noted that the CDC Foundation was among the first foundations in the nation to activate its emergency response fund in an effort to be in front of COVID-19, and this action has provided valuable lessons in activating immediately versus waiting for community spread.

However, the private sector has not always been actively engaged in public health issues. Dr. Monroe believes the pandemic has awakened the private sector partners that have never before engaged in public health, but she noted that they are now working towards long-term partnerships. "The private sector is working with us to problem solve. We have scientifically-based guidance from CDC, but we need to practically apply it in the field. The private sector has the expertise to help us build out that practical guidance."

This points to the larger vision that we all need each other—government, private organizations, non-governmental organization—to make an impact. Dr. Martin noted "the sum of our parts is greater than the individual." She also

conveyed that "we partner to strengthen public health response and preparing and preventing disease outbreaks is the most efficient way to stop pandemics from happening in the future."

In Dr. Monroe's closing remarks, she noted "I have come to believe trust is what we need at this time, and the only thing that moves faster than a virus is trust. How we have been able to quickly respond has been years in the making."

You can watch the webinar in its entirety to learn more about PPP pandemic responses here

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Amy Tolchinsky is the communications director for the CDC Foundation.

https://www.cdcfoundation.org/blog/why-public-private-partnerships-strengthen-our-public-health-response