Dr. Katherine Duncan, PhD
President, IEEE-USA
2001 L St. NW, Suite 700
Washington, DC 20036

The Honorable Nancy Pelosi
Speaker, U.S. House of Representatives
Washington, DC 20515

May 7, 2021

Dear Speaker Pelosi:

On behalf of the IEEE-USA, representing America's technology professionals, I am pleased to provide the following comments on H.R. 2731, the Endless Frontier Act (EFA), which IEEE-USA enthusiastically supports.

The EFA is a bold, visionary economic development bill that will increase investments in science and technology innovation. It uses one of America's greatest strengths - technological innovation - to spread prosperity broadly and widely across American society, ensuring that the benefits of that innovation are more equally distributed geographically across the country and within the American population.

The EFA is generally seen as a research bill, which it is, in part. The bill allocates roughly $100 billion towards 10 broad categories of innovation. This is a good start. While IEEE-USA believes investment in all fields of research are important, there is also value in focusing some of our country's investments into the most promising fields.

Although it must be noted that the ten chosen fields are very broad. Quantum computing, for example (perhaps the narrowest of the focus areas), involves far more than just computer engineering. Research into quantum computing requires research into electrical and mechanical engineering, material science, chemistry, physics, mathematics, and a host of other fields. Artificial Intelligence, robotics, and cybersecurity requires research into the social sciences and how people adapt with new technology. In fact, virtually all parts of America's scientific ecosystem benefits from the new research investments found in the EFA.

The focus area priority list will change over time. The EFA requires that the list be re-evaluated every 4 years and can be expanded in extraordinary circumstances. These useful provisions will ensure that the research priorities remains both current and focused enough to stay effective.

The use of broad focus areas will further promote cross-discipline collaborations. Encouraging experts from different fields, with different backgrounds, and different approaches to problem

solving ensures the creation of innovative research environments, benefiting research well outside of the focus areas.

The broad-but-targeted approach taken by the EFA is especially useful because it directs additional research dollars at fields that are uniquely important to the American economy and our national defense. COVID has given all of us a vivid look at the importance of communication technology, for example, while advanced battery technology has enormous implications for the environment and society. The link between innovation and national security is not only well established but is becoming more important over time. The United States must remain competitive in fields like computer chip design and high-performance computing to create the tools necessary to protect our country and to generate the economic activity needed to maintain those protections.

Rather than passing fads, these 10 focus areas represent the most promising and important fields of research in the global economy. Many will define the 21st century and will become the source of job growth and prosperity in whichever countries can master them. Just as the United States focused energy and resources space exploration in the 1950's and 1960's, there is value in focusing on AI, robotics and advanced computing in the 2020's. After all, our dominance of space in the 1980's and 1990's was the direct result of investments made 30 years earlier. These investments resulted in world-leading advances in the computer, medical, communication, and aerospace technologies that now employ millions of Americans in companies all over the country.

We believe that our great nation - the first nation to put humans on the moon - can win the race to lead in the key technologies of the future, but only if we adopt the similar policies to those in the 1950's and 1960's by targeting investments in critical fields of research.

But to IEEE-USA, research itself isn't the most exciting part of the EFA. Basic and applied research across all the fields of science are necessary for technological innovation. But research is only half the job. Innovation that stays in our national labs or universities may be interesting and valuable, but not nearly as valuable as innovations and ideas developed in our universities and national labs that reach the broader public.

And this is where the EFA is most visionary.

The EFA creates or expands a number of government programs designed to help bridge the "valley of death" between research and applications. This is a challenge all countries struggle with, including the United States. Filling the valley, or narrowing it, will not only benefit all Americans, but it will act as a force-multiplier for our research: more innovations for the same investment.

For example, the EFA calls for the creation of between 10 and 15 Regional Technology Hubs. These hubs will be formed around consortia of businesses, universities, and other groups for the purpose of supporting "*…regional economic development that diffuses innovation around the United States,*

enabling better broad-based growth and competitiveness in key technology focus areas." Hubs work to create the conditions necessary to pull innovation out of our national labs and universities and turn those ideas into products, businesses, and jobs for a specific region. The EFA requires the consortia organizing a hub to think about innovation from a regional perspective. That is, what does Milwaukee need to become a world-leader in battery technology? What does Tennessee need to take advantage of the cybersecurity program at the Univ. of Memphis?

This regional approach to innovation is one of the EFA's strengths. Rather than seeing research as something that happens "over there" at the local university or national lab, the EFA requires communities to see research as a part of that community, and to plan accordingly. The EFA explicitly requires hubs to *"…create the conditions within a region to facilitate activities that establish the global competitive edge of the United States in the 21st century across a range of technology and innovation sectors critical to national and economic security, including to encourage lower-cost but economically viable technology hubs in the United States to reduce technology offshoring*." Research has been placed in its most effective context – as part of a broader regional economy.

Moreover, these hubs must be distributed around the country in communities, especially small rural communities, "*focusing on localities that have clear potential and relevant assets for developing a self-sustaining competitive position in a technology or innovation sector but have not yet become leading technology centers*."

If we were to look at a map of the United States in 1980, and mark on it where innovative companies were located, those companies would be clustered in a few cities, most importantly: San Jose/San Francisco, Boston, Austin, and the Research Triangle in North Carolina. Research and innovation could be found, of course, in other cities, but those five dominated.

If we look at a similar map today, we would find more innovation occurring in almost every corner of the country – but that San Jose/San Francisco, Boston, Austin, and North Carolina still dominate.

The EFA is an explicit attempt to diversify innovation across the United States by pulling innovation and innovative companies into the rest of the country. The big five tech clusters are still important, and will remain so, but there is value in equalizing the distribution of innovation.

Moreover, there are innovative Americans scattered all across the country, but we do a poor job of fostering environments where innovative people can thrive – either because local economies don't have the needed resources or because local workforces don't have the needed skills. The EFA tackles both problems.

The EFA won't just help encourage innovation across the country, it will spread the benefits of technological innovation more deeply within American society. This bill makes workforce training a

part of the regional technology hubs, as it should. Innovation requires innovative people, without whom any regional development plan will fail.

The EFA is clear that workforce training includes funding and scholarships for graduate students, as it should. Our best students are needed to develop the brilliant ideas necessary to create dynamic companies. But the EFA doesn't just fund our best students. Importantly, it also includes undergraduate and community college students who also have a vital part to play in driving innovation. And then it goes further, to include training programs, professional master's programs, and technical training.

America needs to nurture our best minds to help them become brilliant engineers and scientists. But we can't build an economy based on their brilliant inventions and ideas without skilled professionals to back them up.

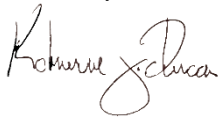
It is certainly true that SpaceX would not exist without the genius of Elon Musk, but it is equally true that, without an army of skilled professionals behind him, there also would not be a SpaceX. Innovative economies need all types of skilled professionals. Some need PhDs. Some need to know how to weld. The EFA, and IEEE-USA, supports both.

Other innovation infrastructure programs supported by or included in the EFA include Manufacturing USA, manufacturing extension centers, university technology centers, EPSCoR, SBIR & STTR programs, Hollings Manufacturing Extension Partnership, critical supply chain protections, and Regional Technology Strategy Grants. In most cases, the EFA encourages or requires that these programs seek out communities that have been thus far excluded from our innovation ecosystem. Minority serving institutions, tribal institutions and governments, and underprivileged Americans are specifically included frequently.

The consequence of this will be a more equal distribution of the benefits of technological innovation and a dramatic improvement in America's ability to move ideas out of labs and universities and into broader society. Therefore, Congress should not see the Endless Frontier Act as a "research bill." It is much more than that. The Endless Frontier Act is a national innovation and technology transfer infrastructure bill that will encourage innovation and promote competitiveness across the country.

The IEEE-USA supports the Endless Frontier Act and urges Congress to pass it quickly.

Sincerely,



Katherine J. Duncan, PhD
2021 IEEE-USA President