

Chairwoman Stevens, Ranking Member Feenstra, and members of the Committee thank you for inviting me to this important hearing. I testify today as the Director of the Pennsylvania State University Center for Nanotechnology Education and Utilization, known as CNEU.

CNEU was established in 1998 to address the needs of the Pennsylvania semiconductor industry for skilled workers, and is dedicated to preparing them across the full range of micro- and nanofabrication applications. The resources of CNEU, which includes an outstanding infrastructure of faculty and a cleanroom dedicated to hands-on student experiences, are focused on the incorporation of nanotechnology into all levels of education. CNEU worked with industry and over 40 Pennsylvania post-secondary institutions to create degree programs incorporating nano-scale fabrication and characterization with an emphasis on semiconductor processing.

A strong semiconductor-based industry must have a workforce skilled in fabrication, and characterization at the nano-scale. CNEU pioneered and

developed its “*resource-sharing*” approach, which is forming partnerships between research universities, industry, and community colleges, to enable critical hands on training as well as expert faculty resources, that are not available at community and technical colleges.

This resource sharing model established CNEU as a global leader in nanotechnology education and workforce development. Subsequently in 2008, the Advanced Technological Education Program at the National Science Foundation created the Nanotechnology Applications and Career Knowledge Center, or NACK, at CNEU. NACK has helped to provide needed national micro- and nanotechnology education infrastructure for the country by supporting, coordinating, and integrating efforts by research universities and community and technical colleges across the entire U.S. As a result of NACK’s efforts, education and workforce development programs in micro- and nanotechnology are growing at universities and community colleges throughout the U.S.

Industry and research universities have an important role to play in assisting workforce development institutions in preparing a skilled semiconductor workforce. This includes: sharing infrastructure; advising on the skills needed; providing development opportunities for students and educators; funding and donating functional equipment; and assisting in student recruitment by highlighting the merits and opportunities of joining the microelectronics workforce.

In 2008, CNEU piloted the Remotely Accessible Instruments for Nanotechnology (or RAIN) Network, which enables web access to state-of-the-art nanocharacterization tools for hands-on experiences for institutions without these capabilities. To date, 28 RAIN partners have provided close to 600 remote access sessions to over 11,000 students. NACK is currently working with the NSF Micro Nano Technology Education Center to further expand the RAIN Network and its utilization.

For the U.S. to fill the gap in the semiconductor workforce, it is important to draw significant numbers of skilled workers from

underrepresented ethnic populations. Therefore since 2018, CNEU has collaborated with Historically Black Colleges and Universities and Hispanic Serving Institutions. To date and from African American and Hispanic ethnic groups, 45 students, including 22 females, have been trained at CNEU in addition to 167 other students from the same groups trained remotely.

Enhancing the representation of females and other minority groups, including military veterans, is crucial in diversifying and promoting equity and inclusion in the microelectronics workforce. In the past two years, CNEU offered the “Nanomanufacturing Certificate Program” for veterans recruited from military installations in the Tidewater region in Virginia. This work is in progress and includes attempts to expand the program to other branches of the military.

During this challenging time to our nation’s semiconductor industry, workforce development needs to be effective, efficient, and outcome driven. This calls for Federal Government intervention and action to boost the semiconductor manufacturing workforce development. Ways in which the

government can assist may include: implementing the Chip Act; supporting creation and sustenance of workforce education partnerships; and identifying ways to incentivize industry to become more engaged.

Thank you and I look forward to answering your questions.