



CSCU



T.E.A.M.

Technology Education Advanced Manufacturing



WORKS

Advanced Manufacturing Strategic Plan

February 2019



Author

Michael Kozlowski

Director of Strategic Initiatives



Executive Summary

Connecticut's manufacturing industry is estimated to need between 25,000 and 35,000 new skilled workers for the state's 4,100 manufacturers in the next 2 decades. This realization offers compelling support for the idea that manufacturing in Connecticut is more than revived, it's resurgent.

Initial steps are underway to execute a strategic plan to produce the workers needed. Though CSCU has the largest higher education network in Connecticut, with 17 institutions and 85,000 enrolled students, its 8 Advanced Manufacturing Technology Centers do not have the capacity for the numbers of graduates needed by the industry. As a result, the plan calls for the collaboration of additional public and private higher education providers, as well as the state's comprehensive and technical high school systems.

Plan Objectives

Achieving the key objectives will result in a network designed to facilitate the training of thousands of skilled workers. **The objectives are:**

- Build a manufacturing education team with CSCU, private providers, and technical and comprehensive high schools, to create the greatest number of classrooms and labs for Connecticut
- Innovate course delivery methods, enabling online engagement, and reducing the cost of "brick and mortar" expansion
- Identify funding sources to expand advanced manufacturing programs in the future
- Attract and train sufficient numbers of students to meet Connecticut's workforce needs

Plan Elements

To achieve these objectives, CSCU and its prospective educational partners will have to execute a number of action items. Success in accomplishing these will not only support the plan objectives, but also create the foundation for the continued growth of manufacturing in Connecticut. **The following are the main elements of the plan:**

- Quantify workforce demand
- Quantify cost of expanding CSCU's advanced manufacturing network
- Determine staff and equipment needs for expansion
- Explore alternatives to add capacity and mitigate costs
- Identify enhanced job placement resources
- Define the marketing needs
- Establish good governance
- Seek additional funding to expand education/training
- Define performance metrics to track success



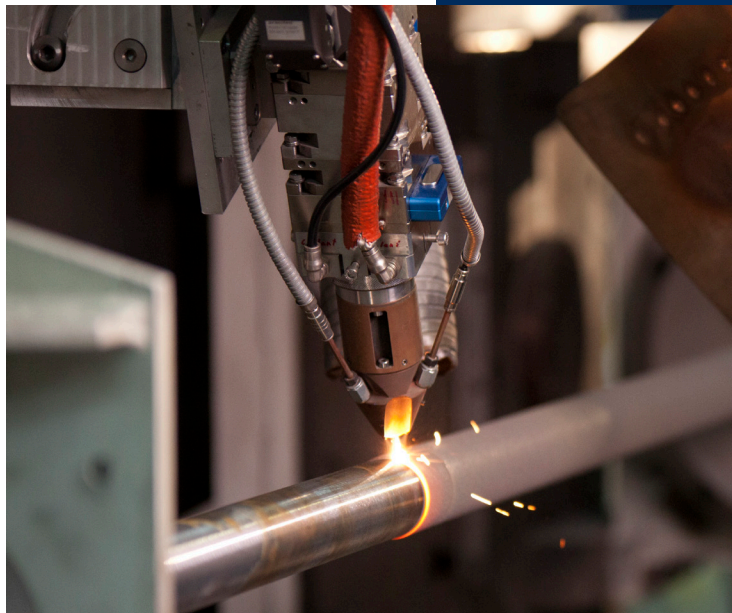
Introduction

Connecticut's manufacturing industry is estimated to need between 25,000 and 35,000 new skilled workers for the state's 4,100 manufacturers in the next 2 decades. This realization offers compelling support for the idea that manufacturing in Connecticut is more than revived, it's resurgent.

During the past 8 years, CSCU has been producing increasing numbers of highly skilled workers in its advanced manufacturing programs. In the last 2 years, facilitated by a \$15 million grant by US Department of Labor, CSCU significantly expanded its efforts to stay ahead of the expected growth curve. The grant enabled CSCU's expansion of Advanced Manufacturing Technology Centers from 4 to 7, putting affordable education and training within the reach of more students. (Recently, we added an 8th Tech Center in the Greater Hartford area.) The grant allowed the addition of classrooms and labs, instructors, equipment, and a marketing campaign to create public awareness and recruit new students. As a result, CSCU doubled enrollment in certificate and incumbent worker manufacturing programs. This year, CSCU expects to produce 800 certificate students, and train more than 2,000 incumbent workers. Recently, Three Rivers Community College (TRCC), Quinebaug Valley Community College (QVCC), and the Eastern Connecticut Workforce Investment Board collaborated with General Dynamics Electric Boat (EB) division to develop a specific, just-in-time training program to meet EB's standards for new workers. This shorter training program, and those in development for other manufacturers, are now a permanent part of the CSCU advanced manufacturing program portfolio.

All curricula used in CSCU classrooms is developed with our manufacturing partners, and their supply chain manufacturers and trade associations. Their input ensures CSCU's courses and programs continue to meet industry's evolving needs, and support new technology in aerospace, defense, biomedical and other high-tech sectors.

**There are 12,000 - 13,000
unfilled manufacturing jobs
in CT, today**



Introduction (cont.)

The next challenge for CSCU, and Connecticut, will be scaling advanced manufacturing programs to meet the demand for thousands of workers in the next 2 decades. Producing more workers will require more than just an expansion of the CSCU network. It will require collaboration of many or all of Connecticut's education providers, including the technical and comprehensive high schools, and the introduction of innovative channels to deliver training and job placement for manufacturers and graduating skilled workers.

Initial steps are already underway to execute this plan. CSCU has already begun planning an aggressive marketing campaign to reach prospective students and create interest and awareness, building on CSCU's successful 2016/2017 "MakeIt. Here." campaign. A partnership agreement between CSCU and the state's technical high school system (CTECS) is in the final stages of development to extend CSCU's reach beyond the community colleges to the state's technical high schools. An expansion of the "College Connection" program is underway to attract high school students to careers in advanced manufacturing. (College Connections, grants course credits to high school students, reducing the number of courses required to earn a manufacturing certificate once enrolled at one of our colleges.) The Manufacturing Pipeline Initiative launched by the Eastern Connecticut Workforce Investment Board, is being replicated in the New Haven area, led by the Workforce Alliance, with Gateway and Housatonic Community Colleges. Finally, initial conversations are underway to promote close cooperation between CSCU and the state's private higher education providers.



25,000 - 35,000
new employees are needed
in the next 20 years

Strategic Plan Objectives

Build a Team

Build a manufacturing education team with CSCU, private instructional providers, and technical and comprehensive high schools, with the goal of creating the largest network of classrooms and labs for students

Innovate Course Delivery

Develop innovative course delivery methods to enable students to get instruction online, thereby reducing the cost of “brick and mortar” expansion

Identify Funding Sources

Identify funding sources available to expand and operate scaled advanced manufacturing programs in the future

Train Students

Recruit and train sufficient numbers of students needed for the manufacturing industry in Connecticut to meet the state’s future skilled workforce needs

To maximize the odds of achieving these objectives, a number of actions will need to be taken, beginning immediately. These actions are identified in the sections that follow.

Plan Elements & Action Items

Quantify Workforce Demand

The number of skilled manufacturing workers needed in the next two decades varies somewhat based on the source asked. CSCU has polled a number of industry sources, trade associations and others to clarify what the number actually is. As indicated earlier in this document, the low end of the spectrum is 25,000 workers, while the high end is placed at 35,000. If these numbers define the low and the high of workforce needs, either of them dwarfs CSCU's current capacity.

The enormous number of workers needed by Connecticut's manufacturers is based on two contributory factors: new business growth and the impact of thousands of worker retirements during the next 10 years. Given the current vacancy rate, CSCU expects to have the classroom and lab capacity to meet this need, with modest investment for instructors, support staff and equipment. By 2024/25, however, when an expected "silver tsunami" arrives, CSCU capacity will fall well short of the needs.

For example, manufacturers project their hiring rate will reach roughly 2,500 workers a year for the next 5 years. In the years between 2024 and 2026, and beyond, this rate will increase to 3,000 annually, due to new US defense needs, new contracts, and retirements throughout the industry. The following chart contains the best available estimates of hiring trends at this time:

25,000+ New Employees Needed (2019-2028)*

2019	2,500
2020	2,500
2021	2,500
2022	2,500
2023	2,500
2024	3,000
2025	3,000
2026	3,000
2027	3,000
2028	3,000

These numbers developed with input from manufacturers, the Connecticut Business and Industry Association, Connecticut Economic Resource Center (CERC), industry trade associations and others. As such, we believe they represent a reasonable estimate for planning purposes. In the weeks and months ahead, CSCU will continue to validate or update these numbers as more concrete data becomes available.

*Expectations based on Electric Boat and Pratt and Whitney documented hiring plans; also includes anticipated hiring needs of remaining 4,100 Connecticut manufacturers

Action Items

- Seek additional industry input to confirm or adjust the number of workers needed in the next 2 decades
- Develop new workforce estimates and update this plan annually

Quantify Cost of Expanding the CSCU Advanced Manufacturing Network

CSCU's advanced manufacturing program was designed to operate as a subsidized program, to keep it as affordable as possible for our students. However, state budget contributions to the program have trended downward for a number of years, requiring the CSCU system to absorb an increasingly larger percentage of the costs of offering these courses. Each of the 8 advanced manufacturing colleges will produce operating deficits for the foreseeable future. The table below demonstrates the magnitude of the challenge CSCU faces, and how it grows as more students enroll. (The figures included in the chart represent average operating costs for 10-month certificate program at the colleges, along with the average tuition and fees our students pay.)

As can be seen, the average cost of training each student seeking a certificate is \$15,500. Per-student tuition and fees (whether out of pocket, or from Pell and other college-provided grants and scholarships) average \$7,000 per student. The remaining \$8,500 must be covered by the colleges. (Revenue from incumbent worker and other training defrays colleges' losses, but only minimally.) It is important to note that the numbers below reflect the projected revenues and costs of expanding CSCU's program as a sole instructional provider if no additional providers are added.

Projected Costs

As enrollment demand grows to meet workforce needs, the costs of expanding CSCU programs will increase. The program costs and operating deficits are projected as follows:

Academic Year	2019	2020	2021	2022	2023
Enrollment	2500	2500	2500	2500	2500
Avg. Cost per Full-Time Equivalent	\$38,750,000	\$38,750,000	\$38,750,000	\$38,750,000	\$38,750,000
Tuition Revenue	\$17,500,000	\$17,500,000	\$17,500,000	\$17,500,000	\$17,500,000
System Revenue Deficiency	-\$21,250,000	-\$21,250,000	-\$21,250,000	-\$21,250,000	-\$21,250,000
Academic Year	2024	2025	2026	2027	2028
Enrollment	3000	3000	3000	3000	3000
Avg. Cost per Full-Time Equivalent	\$46,500,000	\$46,500,000	\$46,500,000	\$46,500,000	\$46,500,000
Tuition Revenue	\$21,000,000	\$21,000,000	\$21,000,000	\$21,000,000	\$21,000,000
System Revenue Deficiency	-\$25,500,000	-\$25,500,000	-\$25,500,000	-\$25,500,000	-\$25,500,000

Determine Staff and Equipment Needs for Expansion

While CSCU has the space to meet manufacturers' needs through 2023, we will need additional faculty and support staff to train the number of students we need to produce, beginning in 2019. As such, it is critical that we begin to identify the means of locating a pool of instructors and support staff from which we can draw as the need develops.

First, however, CSCU will have to project the number of instructors and staff needed each year, as well as the equipment required for the hands-on training. There are a variety of options available to identify a potential pool. For example, retiring or retired manufacturing workers represent a good potential source of instructors, and CSCU's manufacturing partners may also provide a ready source of talent. Additional channels may be available through the Connecticut Department of Labor, AARP (with whom CSCU has already launched an effort to identify candidates), and from Connecticut's technical and comprehensive high schools.

Action Items

- Identify faculty, staff and equipment needed, including:
- The number of additional faculty and staff needed to meet target worker production (numbers and total cost), based on state higher education standards
- The additional manufacturing equipment needed at each program (numbers and cost)
- Define the instructor credentials and standards required for certificate, incumbent worker and "basic" training programs
- Develop the anticipated timeline when these resources are needed to come online

Explore Alternatives to Add Capacity and Mitigate Costs

Because the cost of reliance on a CSCU-only solution identified above is prohibitive, it is necessary to explore the availability of other public and private education providers to augment CSCU's network. These institutions are able to provide additional space, faculty, and staff to reduce the cost of CSCU-only expansion. Initial discussions have already begun with Goodwin College to determine how they can add capacity to the CSCU network. Other providers, like Porter and Chester, Lincoln Tech and Connecticut's comprehensive and technical high school system must also be approached to determine their level of interest in participating. All

of the providers involved in the project will need to collaborate closely in developing and delivering new instruction methodologies, and to commit to consistent, minimum success outcomes for all students.

CSCU is considering a number of other strategies to mitigate expansion costs. These strategies have the potential to reduce operating as well as capital costs. For example, many of the classroom-delivered courses required for certificates and non-credit courses can be delivered online with equal effectiveness. Online courses will also enable us to avoid to a certain extent expansion

Explore Alternatives to Add Capacity and Mitigate Costs (cont.)

or addition of classroom space. Just as important, it will make it possible to provide courses on a more flexible schedule, enabling students to balance education with the demands of their personal schedules. While hands-on, in-person lab work will still be required, the additional flexibility afforded should make it possible for increased enrollment.

All providers involved will need to collaborate in developing and delivering new instruction methodologies

Another strategy relates to a developing partnership between CSCU and the Connecticut Technical Education and Career System (CTECS). An agreement that will enable CSCU community colleges to hold classes in many of CTECS' high schools across the state is in final review by both organizations. The high schools will be available late afternoons and evenings, adding capacity and increasing access for our students, as well as making it possible to extend pathways into advanced manufacturing for high school students studying in those high schools.

Many efforts are currently under way in Connecticut to introduce younger students to manufacturing careers. For example, the Connecticut Science Center actively administers ongoing programs with CSCU community colleges to expose K-12 students to Science, Technology, Engineering and Mathematics. The Connecticut Center for Advanced Manufacturing (CCAT) provides career awareness programs to high and middle school students through its Young Manufacturers Academy. Goodwin College visits high and middle schools across the state to create interest among K-12 students through its "manufacturing in motion" program. As part of this plan, we will expand those efforts to reach more K-12 students across Connecticut to develop interest in STEM and manufacturing curricula and careers.

Action Items

- Identify the maximum current capacity of CSCU's advanced manufacturing programs, by college
- Determine the maximum current student capacity available from other providers (private colleges and schools)
- Quantify the additional space needed network-wide (CSCU and other providers) to meet targeted worker production
- Identify the additional education providers willing to join the team, and their commitment to producing consistent outcomes
- Draft a plan for conversion of selected curriculum to an online format, and identify the projected completion and delivery dates

Finally, CSCU, Goodwin College and CCAT recently applied for a Department of Economic and Community Development Manufacturers Innovation Fund grant designed to provide mobile training labs that will travel across Connecticut. If the grant is awarded to CSCU, Goodwin and CCAT, it will make it possible for us to expand on-site and on-demand education for incumbent workers, K-12 students, and the Connecticut's Second Chance population.

Identify Enhanced Job Placement Resources

Due to the projected volume of graduates that will be produced, job placement support will be critical to the speed with which graduates start work.

Alternative approaches must be considered to generate rapid job placement

CSCU's current advanced manufacturing placement rate is 95% (system-wide), due to individualized efforts our program directors and support staff currently undertake on behalf of the students. However, as the number of completing students grows in the coming years, this "high touch" approach will become impossible.

As a result, alternative approaches must be identified and considered to expedite placement, including any or all of the following:

- Establish of a referral database accessible to small and large manufacturers
- Initiate direct channels between education institutions and manufacturers' Human Resource departments to provide for real time candidate search and selection
- Develop closer, more direct connections between institutions and Workforce Development Boards to facilitate matching and hiring
- Explore the more systematic use of "conditional offers" for enrolled students to expedite the hiring of these workers
- Engage additional 3rd party placement providers

Action Items

- Discuss options with CSCU program directors to determine if relationships with employment or career services agencies currently exist
- Initiate discussions with the state's Workforce Development Boards to determine what role they can play in placing graduates
- Discuss opportunities with CT DOL for additional job placement channels/ opportunities
- Develop relationships with regional job placement "partners"
- Determine whether opportunities exist to have program providers "link up" directly with manufacturers' Human Resource departments
- Engage Workforce Development Boards as resources to promote and expedite candidate placement

Define the Marketing Needs

An effective and ongoing marketing campaign will be critical to attracting and recruiting prospective students. The advanced manufacturing campaign CSCU launched in 2016 (Make It. Here.) illustrates the impact a successful campaign has on recruitment efforts. That campaign, funded by a US Department of Labor manufacturing grant, doubled enrollment in the CSCU program colleges.

A follow-on campaign is currently being developed, designed to meet a number of critical objectives:

- Build awareness of the career opportunities available through manufacturing
- Reposition manufacturing as high tech, high growth and high wage (with careers in biomedical, aerospace, submarine and other leading-edge sectors)
- Reach other organizations, such as high school counselors, the Connecticut Association for Adult and Continuing Education and job seekers at American Job Centers.

In conjunction with the paid media campaign, CSCU also plans to launch an extensive “unpaid” media campaign, with integrated components utilizing regional/community manufacturing events (job fairs, manufacturing workshops, Manufacturing Speakers Bureau, an annual manufacturing forum), periodic press events and media advisories, talk radio and TV interviews, and intensive social media use.

An effective and ongoing marketing campaign will be critical to attracting students

Action Items

- Develop a marketing plan and budget to attract training candidates
- Approve final advertising plan, identify campaign launch date

Make It. Here.SM

Establish Good Governance

To ensure adequate guidance and governance for the advanced manufacturing program, CSCU will empanel a manufacturing advisory board, consisting of the leaders from major and small manufacturing trade associations, related state agencies (Departments of Economic and Community Development, Labor, Veterans Affairs, Education and CETCS), as well as from the Governor's office and cognizant committees of the Connecticut General Assembly. We will also invite leaders from Workforce Development Boards, CBIA and its Connecticut Manufacturing Consortium, and the Connecticut Center for Advanced Technology. This board will help set direction for CSCU manufacturing courses and programs, promote manufacturer engagement, identify additional cost mitigation opportunities, identify ongoing curriculum needs, and establish or agree upon performance metrics to use to determine plan success and report on its progress.

Action Items

- Recommend and invite members to be part of the CSCU advanced manufacturing advisory board
- Develop the objectives, mission and charter for the advisory board
- Set the frequency of meetings and meeting location(s)

Seek Additional Funding to Expand Education/Training

As indicated earlier in this plan, CSCU's advanced manufacturing program was designed as a subsidized program, in which tuition charged was to be augmented by state budget funding. Despite the funding received from the state budget over the years, however, operating costs have experienced deficits throughout the program's history, and that gap will grow increasingly larger as more students enroll. As such, securing additional financial support for the program remains a priority for CSCU.

Determining the actual budget need for any given budget cycle (beyond 2019/2020) will be based on the number of students that enroll, the specific program distribution in which students enroll, the cost reduction impacts of the extent and success of adding other education institutions, and a range of other factors.

Action Items

- Request support funding from Connecticut's Manufacturers Innovation Fund (MIF)
- Seek additional funding from Connecticut's General Assembly in the 2019/2020 state budget
- Identify additional program funding sources (i.e., private sector, foundations, and others)
- Seek federal financial support from the state's Washington delegation and through competitive grant opportunities
- Explore additional opportunities for support from DECD and DOL

The Key Role of Apprenticeship

This strategic plan also recognizes the critical importance of apprenticeship to the future of manufacturing. As such, the expansion of pre-apprenticeship and apprenticeship registrations is a key objective for the TEAM as they execute the plan.

CSCU and the Connecticut Department of Labor are already exploring ways in which more manufacturers elect to benefit from Apprenticeship funds, and provide workers with the ability to earn while they learn. In addition, CSCU community colleges have recently focused additional attention and efforts on registering students as pre-apprentices when they enroll in applicable programs in advanced manufacturing and other industries.

Action Items

- **Develop an apprenticeship tool kit for use in a campaign to attract manufacturers' sponsorships of apprenticeship programs**
- **Work with the Department of Labor, CSCU community colleges, and comprehensive and technical high schools to promote pre-apprenticeship certification for manufacturing-focused students in those institutions**

Define Performance Metrics to Track Success

During the next two months, the CSCU Advanced Manufacturing Team will develop appropriate metrics to track the performance related to this plan. The requisite tasks and milestones will also be identified and published. The progress and performance of the team will be reported semi-annually to the advisory board, the media and the public at large, to ensure that state leaders, Connecticut's manufacturers, and all other stakeholders are aware of the status of the effort.

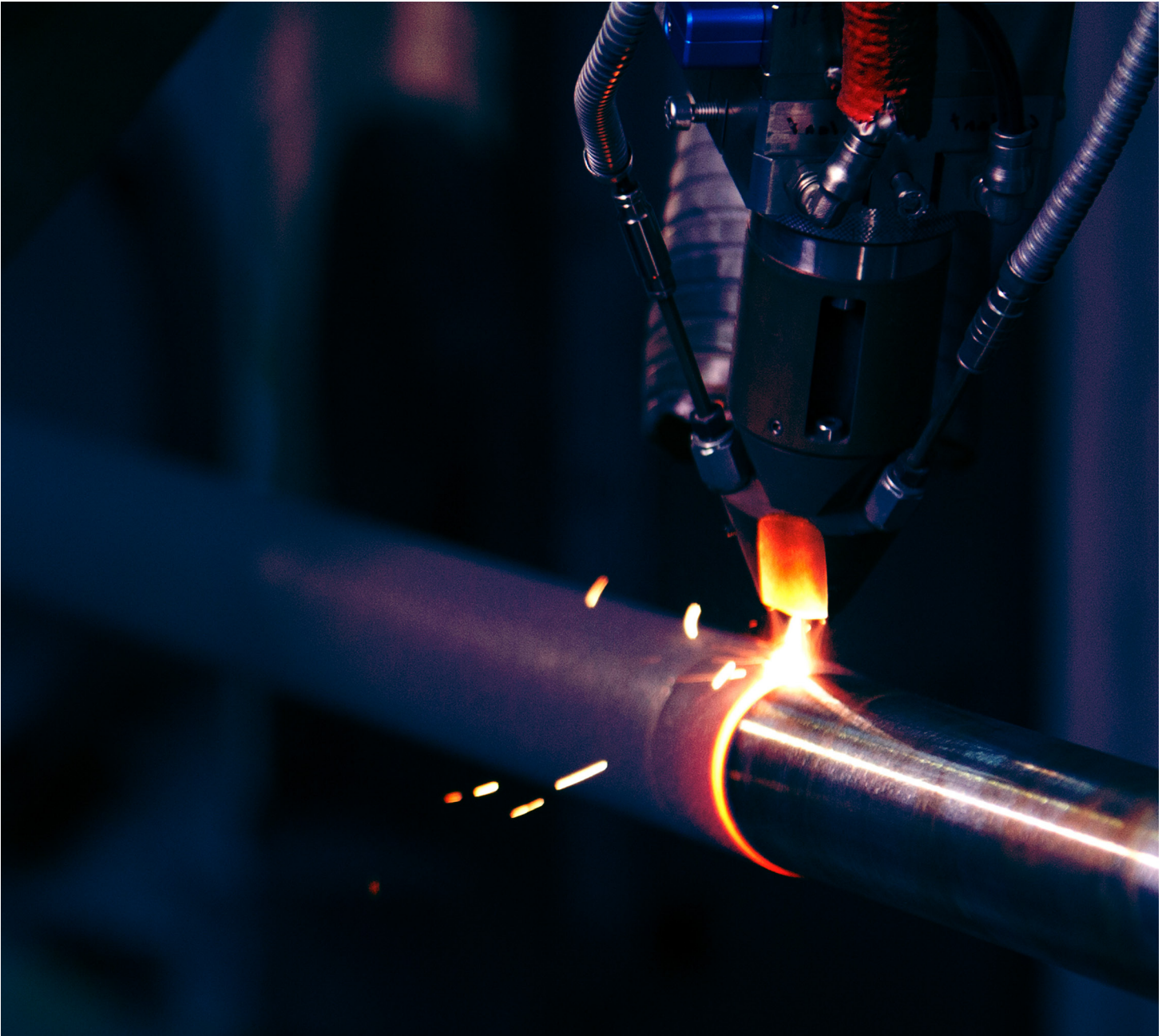
Action Items

- **Determine the performance metrics associated with the marketing, training numbers, job placement, and funding source plan**
- **Establish reporting methodology and schedule for performance tracking**

Conclusion

The next 20 years will pose significant challenges for Connecticut's manufacturing industry, as companies in the sector position themselves to grow rapidly in response to new commercial and defense contract opportunities. The primary challenge will involve identifying and hiring the skilled workers needed to realize those opportunities.

CSCU and other education providers in Connecticut will be the pipeline for those workers, but they face their own challenges—recruiting and training the thousands of prospective workers the companies will need, and scaling up to accommodate the increased enrollment. CSCU began developing a strategy early in 2018, and quickly realized a successful strategy requires looking beyond itself to accommodate industry workforce needs. Based on recent conversations among a number of education providers, Workforce Development Boards, and trade association leadership, we believe there is a shared appreciation of the challenge, and a strong willingness to collaborate in this effort. We will need both to succeed, along with the continued direct engagement of manufacturers and state leadership.



CSCU

www.ct.edu/makeithere