

VERMONT TECH

TO: House Natural Resources Committee
FROM: Daniel Smith
President, Vermont Tech
DATE: January 27, 2016
RE: Perspectives on VTC's Role in the Energy and Natural Resources
Economy

Background

Vermont Technical College is a public college offering technical and career-oriented associate and baccalaureate degrees to students across Vermont and on-line. The college's physical locations include a rural residential campus located in Randolph Center, a suburban campus in Williston, two nursing campuses in Bennington and Brattleboro, and seven satellite nursing sites throughout Vermont. Vermont Tech is one of five colleges within the Vermont State Colleges (VSC) system and the only public technical college in the state.

The college provides students with a rigorous, broad-based background in engineering technologies, software and information technology, agriculture, renewable energy, applied sciences, and allied health. Our graduates are well-prepared to be immediately productive in the workplace, finding career opportunities in technology, manufacturing, agriculture, healthcare, and construction. Our students have consistently maintained a 95% job-placement rate in their fields of study. Our students are tinkerers, gamers, farmers, mechanics, project managers, entrepreneurs, engineers, bridge-builders, nurses, manufacturing technicians and homebuilders.

In a very real sense, our faculty and staff play a major role in educating the state's workforce and providing highly skilled employees across industry sectors. Vermont Tech offers more than thirty degree and certificate programs. In a typical year, the college graduates 550-600 students. Roughly half receive bachelor's degrees, and roughly half receive either an associates' degree or certificate like our Licensed Practical Nursing Certificate. Nearly half of the student body is first-generation, nearly half are Pell grant eligible students and approximately 85% come from Vermont. A similar percentage remain in Vermont after graduation. A career-connected technical degree or certificate is a pathway out of generational poverty and into economic independence for these students.

Vermont Tech has primarily two sources of revenue: tuition and state appropriations. State appropriations are received by the VSC and distributed by the system as determined by the Board of Trustees. Trustees also determine the annual rate of tuition and college-wide fees. The college is mission-committed to affordability for Vermont students, who pay an annual tuition of roughly \$13,000 per year before financial aid awards. Eighty-two percent of our students receive some level of financial aid.

Vermont Tech is truly unique among higher education institutions in Vermont with a mission focused on career-oriented, applied technical education. We are dedicated to the personal, academic, and professional success of our students.

Current Position

Over the last several years, the college faced challenges driven by a period of declining enrollments that are reflective of the demographics of Vermont and Northern New England. After reaching a high point for enrollment in the fall of 2010, by 2014 Vermont Tech had seen a headcount decline of 114 full-time-equivalent students. Concurrent with that decline, operating expenses driven by energy costs, health care costs and collective bargaining agreements went up 4.5% per year while operating revenue from tuition increased at only 2.9% per year. Also concurrent with that decline, the state of Vermont's general fund appropriation for higher education remained fixed at 2008 levels.

More recently, the college has established some momentum. Enrollments in the fall of 2015 were 3% ahead of the prior year. We have reduced our operating shortfall by more than \$2,000,000, addressing roughly 2/3 of the shortfall in the course of one year. In the same year, we jumped 12 spots in the *US News & World Report* rankings (24) for Northern Regional Colleges and three spots (8) among the Public Northern Regional Colleges. We are one of only two Vermont schools in the Regional North ranking. The territory extends as far south as Maryland. According to the U.S. Department of Education scorecard, Vermont Tech ranks fourth (4th) among Vermont colleges for average graduate salary 10 years after completing their degrees, behind Middlebury, St. Michael's College and Norwich University. When it comes to the salary of graduates, Vermont Tech is the highest ranked public college in the state. The combination of affordable in-state tuition and strong professional outcomes is remarkably valuable for the students and state we serve.

Reason for Optimism

The college faces headwinds, but we continue to be the exception to the things that plague higher education in the public's eye.

Our headcount stands at roughly 1550 students, of whom 90% are Vermonters.

It is **affordable** – tuition at roughly \$13,000.

It is **accessible**, offering two and four year degrees at campuses here in Randolph and in Williston, and nursing locations across the state.

Our programs are **economically relevant**, tied to industries vital to the state: energy (just launched a four year BS in Renewable Energy), manufacturing (this fall launching a BS in Manufacturing Engineering), environmental engineering, health care, efficient building engineering and construction, diversified ag, software development and computer systems. There is a role for each in the climate change economy.

Our students learn by doing. Because of the lab and experiential learning intensive education, our entire campus is a maker space. Randolph features a five acre produce garden that feeds campus, a 375kw anaerobic digester that is powered by nutrients from this campus and surrounding farms and businesses, a cutting edge welding lab, civil and architectural engineering labs model watersheds and efficient buildings, a rope tow and ski hill, a brand new manufacturing engineering lab where materials strength is taught with our own ski and snowboard press.

Across the state, when I hear employers concerned about their ability to find decent labor force, I know that the work we are doing cuts against that trend. Our recent job placement reports indicate that 94% of last spring's graduates are employed in their field.

Losing Ground in the Vermont Workforce

According to data from the Agency of Education, in a graduating class of high school students, there are three groups. There are those who go to college out of state. There are those who go to college in state. And there are those who don't go to college. The biggest of those three groups is Vermonters who don't go on to college, not even a two year degree. It exceeds the number of Vermonters staying in state to go to college.

That means we are losing ground year over year on the employability of emerging workers. This is a foreseeable outcome of the state's funding of the Vermont State Colleges and VTC.

Moreover, recent data indicates that only 49% of college-going Vermonters stay in Vermont to do so. The national average for people who stay in state to attend college is 80%.

Campus Facilities

From an experiential learning perspective, the assets of our campuses are remarkable. Our Randolph Center campus, in particular, offers a unique set of opportunities.

Though we are planning some exciting changes for our dairy program, we still have an 85 head dairy farm four hundred yards from campus, functioning both as a full-scale commercial production dairy with students taking responsibility for its operation. In growing feed for the cows, they are learning cover cropping, nutrient management and custom cropping techniques.

Currently building 500kw in solar generating capacity on our little hilltop and net metering our Williston meters under a Vermont State Colleges system agreement.

A biomass pellet boiler heats the historic Red School House in which we teach many of our agriculture and dairy classes.

The college operates a 375kw multi-farm anaerobic digester, also on campus, that allows our students to round their education by studying the cycle of nutrient flow. More than a dozen students have completed training as digester operations apprentices. The facility captures methane from the controlled decomposition of manure and food waste and turns it into heat and electricity.

It is a community based digester, the first of its kind, pulling feedstock from neighboring farms and now, as a solid waste facility, organic waste as well.

Fully realized, the vision for the Randolph Center campus is an almost entirely closed loop, where we can produce our food, generate energy, recycle our waste, and manage our nutrients in away that is a model for Vermont communities.

Once the new state agriculture and ANR lab is constructed on campus in Randolph Center, state regulators and scientists will be a stone's throw from where the next generation of Vermont engineers, technicians, farmers and entrepreneurs are learning how to apply practical skills to some of the state's biggest challenges.

Again, the vision is for the campus to be a model of what is achievable for a small Vermont community. We are already as close to a closed loop as a small public college can get.

Example of Employers in Energy Sector

Our commitment to Vermont employers is to provide them with a competitive advantage based on the level of knowledge and technical skill that our graduates bring to bear.

AllEarth
Suncommon
DynaPower

GroSolar
SolaFlect
NRG Systems
Northern Power Systems
Green Mountain Power
VELCO
Concepts NREC
LED Dynamics
VEIC/Efficiency Vermont
Alpine Snowguards and EcoFasten Solar

Undergraduate Program Highlights

While a number of our programs serve the energy sector, I would like to speak about two specific programs:

The college is in its second full year of a new Renewable Energy bachelor's of science degree that is a blend of engineering, technology, and science alongside business and management courses. The program prepares graduates for careers in the field as project managers, system designers, and field technologists and technicians. The program includes courses in solar, wind, and renewable energy heating technologies, mechanical and electrical engineering and is supported by a dedicated laboratory and several on-campus systems including a 375 kW biodigester, a 500 kW solar PV array, and a biomass pellet boiler.

The energy sector is rapidly growing and as with many industries in Vermont, faces a need for employees with a strong skill-set and technical foundation with a practical applications-based knowledge of the renewable energy field.

In the first full year, we have roughly twelve FTE enrolled in the renewable energy program and we recognize it as an area of growth.

The intersection between agriculture, energy and water quality is an exciting one for the college. The anaerobic digester positions the institution at the front edge of community waste-energy management, and alongside our dairy program offers unique training and experiential learning opportunities.

During the recently concluded Paris Climate talks, author Michael Pollan published a powerful opinion piece in the Washington Post that described agricultural soils as a significant resource in the fight against climate change. He was dead right.

A lot of energy has gone into addressing the release of new carbon and greenhouse gasses into the atmosphere. A lot less focuses on the practices that extract those same gasses. As a college we are committed to developing and teaching agricultural and land use practices that will recover greenhouse gases from the atmosphere and restore them to the soil for future generations.

As a longstanding agricultural institution, the technical aspects of soil-based carbon reduction are part of our culture. Through our on-going delivery of applied technical education, within a deliberate, hands-on framework, the college is training students to trace atmospheric carbon as it moves into plants via photosynthesis and then on into animals as efficiently-consumed forage and pasture by our dairy and beef cows or consumed as college-grown produce served locally.

Our students complete the cycle in a nutrient management course that offers lessons in properly nourishing plants and soil by prioritizing available animal and food waste, in the form of digester effluent, over transported fertilizer.

In the spirit of continuous innovation, we continue to extract our own learning and share it with students and farmers across the state. Here are a few exciting observations made over our 18 months of operation: Although the entire process of moving nutrients from the atmosphere to plant to animal produces CO₂, it captures other, worse greenhouse gases that occur during aerobic decomposition, including ammonia (approximately 170 times worse than CO₂), methane (30 times worse than CO₂) and nitrous oxide (approximately 230 times worse than CO₂).

The reduced levels of nitrogen, phosphorous and potassium that are left over after the process are applied to crops according to a nutrient management plan. This post-digester "effluent" is an improvement on manure. It smells less and is much more easily delivered and applied to fields. Using innovative methods and tools including new dragline technology, the college has pumped this cleaner effluent over a mile through lines and onto our productive farm fields. This displaces several hundred trips in a manure truck and leads to significantly less soil compaction.

More importantly, the convenience and ease of effluent delivery allows the college to improve photosynthesis on our farm. Improved photosynthesis removes significantly higher amounts of greenhouse gas from the atmosphere. With minimal effort, using enhanced cover-cropping strategies, our on-campus farm produced 200 more tons of crops this year. This equates to about an extra ton per acre of land that we farmed. Importantly, what gets taken off a field of grass at harvest is probably only half the carbon that was captured from the atmosphere. The other half resides in the plants' roots, which hold nutrients in the soil and capture water, greatly decreasing the chance of runoff and reducing the pollution of our state's waterways.

Incredible innovation is occurring at Vermont Tech, and we have students managing every step of the way. At Vermont Tech, greenhouse gas management is taught and applied: we teach combustion, we teach photosynthesis, we teach decomposition and we tie it all together with logistics and entrepreneurship. We are training our state's future farmers and citizens to see and value carbon through the entire circumference of the circle.

As alumni, their farms will be more profitable, our state waters will be cleaner, fewer greenhouse gasses will be produced, more will be captured and those nutrients will feed the cows that make the milk and cheese and yogurt and grow the hops and produce that help drive our economy.

Continuing Education and Workforce Development

With the recent demand for solar installation in Vermont, Vermont Tech has heard from business partners that there is a common and growing challenge of unskilled and/or under skilled personnel. At the Renewable Energy Vermont (REV) annual meeting the topic of poorly skilled installers was such a concern that the board committed to developing goals surrounding quality education and skill upgrades for the solar installers.

In order to address the skills gap and current lack of formalized training across many of the current installers, Vermont Technical College (Vermont Tech) and the Community College of Vermont (CCV) have teamed up to provide training that is certified by the North American Board of Certified Energy Practitioners (NABCEP). A mobile group of four (4) trainings is being presented for funding allowing training to be offered in multiple areas of the state to meet demand. This industry recognized training would educate the future solar installers, and existing solar personnel in an industry standard that is a requirement in most New England states to order install, maintain, or sell solar systems.

According to the Clean Energy Industry Report issued in September of 2015 by Governor Shumlin and the Vermont Department of Public Service the solar industry has increased by 22% in the past year alone. The report also indicates the addition of approximately 1,000 jobs in the solar industry the next six months. It will be imperative that these installers are properly trained in order for homeowners and commercial owners to realize the benefits of these solar projects.

The grant allows us to further develop the curriculum and acquire the necessary materials needed to make all of these trainings mobile. This would allow us to offer trainings in the four Vermont locations where we have been receiving great interest for solar PV personnel training. The planned trainings will occur in: Brattleboro, Rutland, Randolph, and Williston.

A participant could take all the trainings in the series or pick and choose which option best suits their needs. Vermont Tech is also able to offer up to four (4) credits for participants who take all three of the Solar PV classes and lead into the Bachelor of Science in Renewable Energy.

Trainings will utilize Vermont Tech and CCV classroom facilities, and if applicable local career and technical center facilities. Participants will also visit local examples of existing solar PV systems in regional areas, highlighting both residential and commercial systems.

Training Curriculum:

CCV'S Governor's Career Readiness Training (CRC) offered by CCV.

In this 30-hour training participants who are unemployed or with no experience in the solar industry will have the opportunity to gain the skills and training required to be successful in the workplace. CCV has tailored their standard CRC to provide a short on-ramp for prospective employees that includes: developing academic skills, workplace math, locating information on diagrams and charts, basic circuits and electrical math.

Introduction to Solar PV

This 40-hour training will teach to the NABCEP entry-level learning objective for participants looking to begin their careers in the Solar PV field. In completion of this training participants will be eligible to sit for the NABCEP Entry-Level Exam. VTC is an approved NABCEP testing facility for the Entry-Level Exam and an approved NABCEP education provider. Key areas of learning include: Photovoltaic (PV) markets & applications, safety basics, solar energy fundamentals, system components, system sizing & design.

Advanced Solar PV

This 40-hour training is a continuation of the introduction to solar PV training with a greater focus on installation. Participants in this training may already have some installation experience. This training will teach to the NABCEP Installer Certification learning objectives and Job Task Analysis. This training will fulfill the 40-hour advanced solar training requirement for participants applying for the NABCEP Installer Certification. The introduction to Solar PV and Advanced Solar PV trainings combined can fulfill the entire educational requirement needed to apply for the NABCEP Installer Certification.

Solar Tech Update:

An 8-hour training that will cover 2014 electric code updates related to solar, new in VT legislation, and solar PV industry technology updates. This training has been approved by the State of Vermont Electrical Board for continuing education credit hours to be used toward the upcoming electric Solar S license and is in the process of being approved for NABCEP Installer continuing education credits.

Conclusion

As you do your work, consider what it will take to drive economic expansion in the climate economy.

From my perspective, looking at the demand for the technical skills, and the companies recruiting, the age of advocacy is evolving into an age of opportunity that is truly exciting for Vermont.

It matters for legislators and leaders to be aware that the college is gaining momentum and that if you want to see economic growth aligned with environmental remediation, if we are going to have a glimmer of a chance of hitting our targets for renewable energy and watershed recovery, the state needs an army of people with technical skills.

So know that the college's goal is to be an community asset in those efforts, while staying accessible to Vermonters who want to achieve economic independence and career success in industries that are thriving right here in this state.

Whether it is diversified agriculture, manufacturing, construction, health care, software or renewable energy, Vermont Tech has always been connected to the industries that drive the state of Vermont. Among the students, staff and faculty of the college, the spirit of yankee ingenuity thrives.

This state faces great challenges, from the creation of economic opportunity, to the recovery of our lakes and streams, to reducing greenhouse gases and combatting climate change. As we look to these great challenges and the practical skills that can drive both an economic and environmental renaissance, know that they are already being taught, learned and put into practical action by Vermont Technical College.