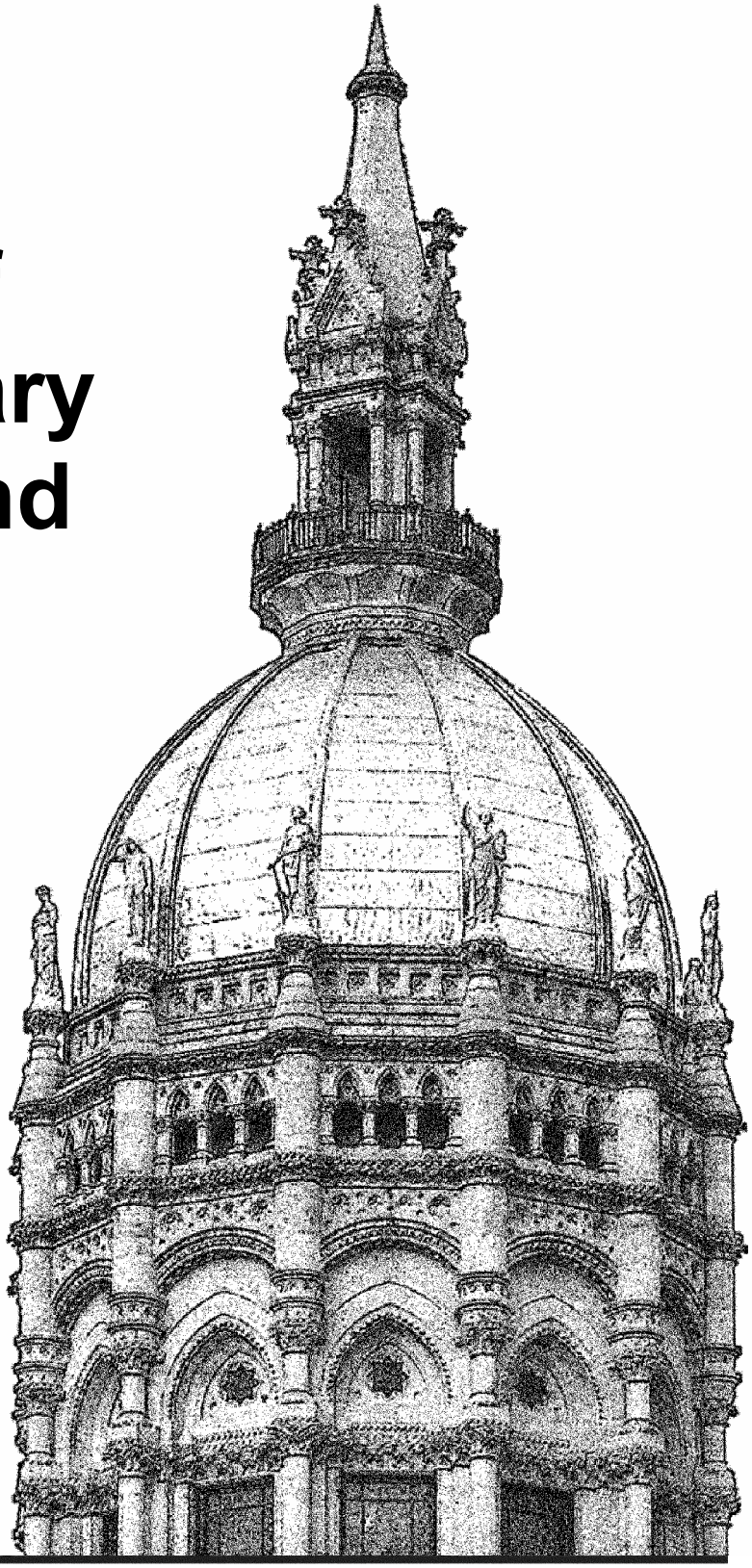
Alignment of Postsecondary Education and Employment

December 2009



PRI

Legislative Program Review and Investigations Committee

Connecticut General Assembly

CONNECTICUT GENERAL ASSEMBLY
LEGISLATIVE PROGRAM REVIEW AND INVESTIGATIONS COMMITTEE

The Legislative Program Review and Investigations Committee is a bipartisan statutory committee of the Connecticut General Assembly. It was established in 1972 to evaluate the efficiency, effectiveness, and statutory compliance of selected state agencies and programs, recommending remedies where needed. In 1975, the General Assembly expanded the committee's function to include investigations, and during the 1977 session added responsibility for "sunset" (automatic program termination) performance reviews. The committee was given authority to raise and report bills in 1985.

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Alignment of Postsecondary Education and Employment

DECEMBER 2009

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ALIGNMENT OF POSTSECONDARY EDUCATION AND EMPLOYMENT

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Executive Summary

Alignment of Postsecondary Education and Employment

The Legislative Program Review and Investigations Committee voted to conduct a study examining *Alignment of Postsecondary Education and Employment* in April 2009. Numerous reports have identified an increasing gap between how well Connecticut prepares its workforce and the demands of current and near-future employment. The focus of the study was to determine whether a formal alignment mechanism exists in Connecticut to match the production of skilled graduates from the state's higher education institutions with the current and projected workforce needs of the state's employers. The study also assessed current workforce supply and employer needs, and reviewed whether pathways exist for technical high school graduates to pursue postsecondary education certificates and degrees. Finally, it offers recommendations to improve alignment.

Postsecondary Education System

Connecticut has 18 public degree-granting institutions and 29 independent colleges and universities, with approximately 185,000 students. The Board of Governors for Higher Education (BGHE) is the central policymaking authority for public higher education in Connecticut. It serves as a coordinating body for all of the public and independent colleges, universities, and postsecondary institutions of Connecticut. The public system of higher education is organized into four constituent units, each with its own board of trustees: the University of Connecticut; the Connecticut State University System; the Connecticut Community College System; and State Academic Awards. The technical high schools fall under the State Board of Education, Connecticut's governing board for K-12 public education.

Existing Alignment Structure

Attention to the importance of the relationship between postsecondary education and employers is not new. Proposals have been put forth by Connecticut's policymakers since at least 1982 with the creation of the Governor's Commission on Higher Education and the Economy. In addition to efforts by policymakers to require alignment through legislation, there are also numerous linkages that exist outside of the statutes between independent postsecondary institutions, business organizations, and individual employers.

The current state organizational structure to facilitate the coordination of postsecondary education with workforce development issues involves a myriad of agencies, boards, higher education institutions, offices, councils, and commissions. None, however, have authority to implement across-the-board strategies, policies, or programs, so this "system" of aligning postsecondary education and employment has occurred in a piecemeal manner. For example, Connecticut currently has multiple state agencies involved in projecting demand, identifying the current state of the workforce, and funding programs for a variety of workforce development initiatives.

Alignment Analysis Results

For this report, the committee compared projected workforce demand for certain selected occupations and whether there was an under- or over-supply of postsecondary graduates with the required skills and knowledge available to meet projected demand. The committee found an overall lack of alignment of postsecondary education and employment for a majority of the occupations examined. (Excluded from this alignment analysis were the many broad college majors that lead to employment in a multitude of occupations.) While some occupations, such as registered nurses, appeared to be particularly well aligned, the majority of occupations examined seemed to have an oversupply (elementary school teachers) or undersupply of workers (industrial engineers).

Barriers to Alignment

The committee identified a number of barriers contributing to the misalignment of postsecondary education and employment. Solutions were recommended to overcoming these barriers, drawing on lessons learned from the detailed examination of the strategies used to successfully align postsecondary education and employment in the nursing profession as well as information learned in studying the emerging green collar jobs field.

1) Barriers Related to Elementary and Secondary School Students – An increasing number of new college students are unprepared for college-level work and are enrolled in remedial or developmental courses. This lack of preparedness can be traced back to elementary and secondary schools, where *an increasing number of students as young as fourth graders do not score as well in science, math, and reading compared to students in other New England states.* Recommend:

- strengthening high school graduation standards; and
- increasing efforts in high school to reduce the need for remediation in college.

2) Barriers Related to Postsecondary Education Institutions – The increasing number of new college students unprepared for college-level work has led to *an increase in the need for remedial or developmental courses*. Recent figures from community colleges indicate *less than half of students, for example, are passing remedial or developmental math courses, a contributing factor to low graduation rates*. Recommend:

- using computer assisted tools and contextual learning for remedial coursework; and
- using peer tutors and implementing an early warning system when students appear to be struggling.

3) Difficulty in Making Accurate Demand Projections – In general, *the ability to forecast 10 years out the types of jobs that will be available in the future is limited,* with projections accurate only about one-third of the time. There may also be a *lack of awareness or limited use of these projections* by postsecondary education institutions and students. Recommend:

- consider using job-vacancy rate data when making short-term workforce demand projections;
- annually compiling teacher shortage area data for at least the past five years and making teacher preparatory programs aware of this information;
- exposing many more high school and college teachers, counselors, and administrators to Connecticut Department of Labor job demand information by changing to an electronic distribution of the report; and
- asking high school guidance counselors, college admission officers, and college career counselors what information and in what format would be most helpful to students in making career decisions.

4) Current Economic Challenges – *Major events such as the recent recession, negatively impact job openings, particularly in certain sectors, like construction and manufacturing.* Current economic conditions might also be impacting college enrollment and decisions of high school students to attend in-state or out-of-state, and to begin postsecondary education at the less-expensive community college versus the four-year state university.

5) Barriers Related to State Agency Organization, Programs, and Policies – *Connecticut's system for public higher education is very decentralized with decision-making occurring at the college or constituent unit level. Budgetary allocation decisions are made at the constituent unit level based on enrollment and other factors, but not on outcomes.* Recommend:

- developing a master strategic plan that links the roles of the separate constituent units and includes how the higher education system relates to the P-12 system and workforce needs of the state;
- developing strategies in the plan, along with the four constituent units, to implement if colleges and universities fail to make progress on the specific accountability measures already being reported;
- in the future and within available appropriations, establishing a pilot program within the Department of Higher Education to be used at the discretion of the commissioner, to reward colleges, universities, or systems that are meeting pre-established accountability goals;
- examining whether academic programs or career pathways need to be established in order to meet the workforce needs of competitive sector-based employers in Connecticut, based on information developed by the Office of Workforce Competitiveness; and
- requiring the Connecticut Community College System to examine the feasibility of transferring the adult education programs currently offered by the technical high schools, including the licensed practical nurse program, to the community colleges.

Selected In-Depth Reviews

Because of the broad nature of the study, the committee decided to examine two areas in depth to see if there were successful state strategies that better align postsecondary education with the needs of Connecticut's employers, for the possible application to other occupational shortage areas. The two areas selected for intensive review were the emerging field of green collar jobs, and the nursing field because the state implemented a number of strategies over the last decade to increase the number of nursing graduates.

Green Collar Jobs. Green collar occupations are a less established, emerging field. The following questions were used to answer the four "D's" of the green collar field:

1. What is **driving** the green movement?
2. How are green jobs **defined**?
3. Who is **developing** the green collar field and where will the job opportunities be?
4. What green collar job education and training is being **delivered**?

Driving. The committee identified a number of factors that are **driving** the move towards green collar jobs: federal stimulus funding from the American Recovery and Reinvestment Act of 2009; Governor Rell's Executive Order No. 23, which established a blueprint for green collar jobs creation; recent Connecticut statutory changes promoting green building code requirements, and implementing green strategies through the Connecticut Clean Energy Fund and the Connecticut Energy Efficiency Fund; and private sector companies and initiatives in the energy sectors.

Defining. There are a multitude of green collar job definitions, but in general, green collar jobs occur in settings with a goal of improving or preserving the environment by using less energy (energy efficiency) and/or alternative sources of energy that are not harmful to the environment (renewable energy). Green collar jobs can fall into one of three categories:

- green *increased demand* occupations – existing occupations performed within a green setting (e.g., chemical engineers);
- green *enhanced skills* occupations – existing occupations requiring additional green skills and knowledge, and perhaps new credentialing (e.g., plumbers); and
- green *new and emerging* occupations – new occupations that arose due to the green economy (e.g., carbon trading analysts).

The present general lack of consensus on what constitutes a green collar job has led to varied estimates on the current size of Connecticut's green collar workforce, ranging from 5,493 to more than 22,000 individuals.

Developing. There are many state agencies and private organizations developing green collar job initiatives in Connecticut. In addition, consortiums and partnerships are currently being formed or shaped. The Connecticut Business and Industry Association and private companies are also active in developing the green collar field.

Delivering. Overall, higher education institutions are delivering education and training for green collar jobs in several ways. First, many colleges and universities offer majors or minors in directly related fields, such as environmental engineering, as well as more general fields that have a green component, like marine biology. Many postsecondary schools also offer certificate programs or individual courses to add or enhance students' green collar skills and/or knowledge. A few colleges and universities have established centers or institutes directly related to renewable energy, energy efficiency, or other green areas (e.g., Institute for Sustainable Energy at Eastern Connecticut State University).

Education and training for green collar jobs is also being delivered by the technical high schools, Connecticut Clean Energy Fund, for-profit institutes, unions, and national training organizations. The committee found several possible barriers to alignment in the green collar jobs area:

- *Lack of awareness or understanding of what green collar jobs are by elementary and secondary school students, parents, teachers, and guidance counselors;*
- *Lack of uniform naming of new green certificate programs;*
- *No central repository for the many green initiatives emerging across higher education (e.g., new degree and certificate programs and stand-alone courses, green-related equipment, and new center/institute initiatives);*
- *Few resources apart from ARRA stimulus funds to purchase the expensive equipment required to train students;*
- *Lack of career ladders/lattices to move individuals out of entry-level green collar jobs that are dependent on temporary ARRA funding; and*
- *Lack of awareness by colleges of green efforts occurring within other colleges in different higher education systems.*

State Efforts to Address Workforce Shortage of Nurses. The second area examined in-depth was the assortment of strategies used to increase the number of nursing program graduates to address a serious nursing shortage that began in the late 1990s. The purpose of this review was to determine if similar strategies could be adopted for other workforce shortage areas.

Active participants in developing solutions to the potential public health crisis beginning in the late 1990s included the executive and legislative branches of government, the education and higher education departments, the four higher education constituent units (acting in concert and independently), independent colleges and universities, and the state's hospitals and other health care facilities.

The efforts dramatically boosted graduation from RN and LPN programs. In the 2007-08 academic year, there were 1,118 graduates of entry-level RN nursing programs in 2007-08 compared to 594 graduates in the 2000-01, the low point over the ten years examined by the committee. The number of students graduating from licensed practical nursing programs also increased dramatically, with 727 individuals passing the practical nurse national exam in 2008 compared to 318 graduates in 1998.

Strategies that contributed to the success of increasing graduates of nursing programs to meet employer demand included:

- public advertising campaigns to increase awareness of nursing as a career;
- initiatives at the high school level to interest students in health careers, including nursing;
- aggressive pursuit of funding by colleges and universities, to provide tuition assistance, student advising, and targeted tutoring with the aim of improved student retention;
- federal and state scholarships and loan forgiveness programs;
- grants to colleges and universities to establish or expand their nursing programs;
- collaborative partnerships between colleges and universities with nursing programs and area hospitals; and
- a formal mechanism, the Allied Health Workforce Policy Board legislatively established in 2005, allowed for members to communicate and share strategies, and propose solutions as a unified body.

Committee Recommendations

The committee adopted a total of 24 recommendations. Taken together, they are aimed at addressing the five possible barriers to alignment identified above.

1. **Wherever possible, the U.S. Department of Labor taxonomy and EE/RE categorization should be incorporated into explanations of green collar jobs.**

2. **The Connecticut Community College System should implement uniform naming of green certificate programs across all member colleges.**

3. **The Connecticut Employment and Training Commission and the Connecticut Energy Sector Partnership should regularly solicit and make widely available information on green efforts occurring among the higher education institutions including new degree and certificate programs, stand-alone courses, and center/institute initiatives useful in the alignment of green collar jobs and employer needs.**

4. **Educational systems should develop agreements to share equipment needed for students training for green collar jobs, such as solar photovoltaic installation.**

5. **Connecticut postsecondary education institutions and state workforce development agencies should, wherever possible, support efforts to create career ladders and lattices in the green collar fields, particularly for those workers who gained entry into the system through temporary ARRA grant opportunities.**

6. **The Departments of Higher Education and Education should prepare an annual cross-system list of green courses, certificates and majors offered, and inventory of green-related equipment.**

7. **Staff from both the University of Connecticut Center for Clean Energy and the Institute for Sustainable Energy at Eastern Connecticut State University should meet at least quarterly to discuss possible ways to collaborate on green initiatives. Staff from other institutions and centers located within the same regions should also form partnerships and meet to develop collaborative efforts.**

8. **Connecticut should pass legislation reforming Connecticut high school graduation requirements as recommended by the State Department of Education in their proposed high school redesign.**

9. **All Connecticut high school juniors should be encouraged to take the Accuplacer or comparable test. Students may use their remaining time in high school to take additional preparatory coursework, utilize software programs such as KeyTrain, or a combination of these strategies to avoid remedial coursework in college.**

10. **Computer-assisted preparation programs such as KeyTrain should be promoted at all the community colleges. Results should be monitored for two years to determine whether use of the selected computer-assisted preparation program should be continued.**

11. **The Connecticut Community College System should consider replacing stand-alone remedial courses with introductory credit courses that integrate remedial skills instruction.**

12. **Connecticut colleges should implement no- or low-cost initiatives to improve graduation rates. Success or failure of efforts should be shared with all colleges on the DHE website.**

13. **The State Department of Labor should continue to pursue development and use of an electronic job vacancy methodology to provide current and near-future information on job demand in Connecticut.**

14. **The State Department of Education should annually compile and electronically distribute to all Connecticut public and independent colleges with teacher preparatory programs information for at least the past five years on teacher shortage areas.**

15. **The State Department of Labor should electronically mail the "Soaring to New Heights" report to all state high schools and colleges, returning to the earlier format that includes information on teacher occupations in demand.**

16. **The State Department of Labor should survey high school guidance counselors, college admission officers, and college career counselors to determine what information and in what format would be most helpful to students in making career decisions.**

17. **C.G.S. Sec. 10a-11b establishing the Blue Ribbon Task Force and requiring the task force to develop a strategic master plan every five years shall be repealed and its responsibilities, along with its reporting requirements, be transferred to the Board of Governors for Higher Education.**

    C.G.S. Sec. 10a-6(a)(2) requiring the Board of Governors for Higher Education to develop a master plan shall be amended to include the word "strategic."

    The goals that the Board of Governors for Higher Education, the Blue Ribbon Task Force, and the Accountability Measures are required to promote, shall be blended into a single set of goals that the strategic master plan should address. The goals identified in C.G.S. Sec. 10a-6(b) for the accountability report shall be adopted and amended to include the goal of protecting academic freedom and maintain standards of quality ensuring a position of national leadership for state institutions of higher education.

    On or before January 1, 2011, and every five years thereafter, the Board of Governors for Higher Education shall prepare a higher education strategic master plan for the state. The plan shall be prepared in consultation with the Higher Education Coordinating Council, which includes the commissioner of the Department of Education and the Secretary of the Office of Policy and Management, and the commissioners of the Departments of Labor, and Economic and Community Development, the director of the Office of Workforce Competitiveness, the chairpersons and ranking members of the Higher Education and Employment Advancement and the Commerce committees, and the chairperson of the board and president of the Connecticut Conference of Independent Colleges, and the president of the Connecticut Business and Industry Association, or their respective designees. The Board of Governors for Higher Education may consult with other entities as determined by the board.

    The plan shall be submitted to the Governor and the Commerce, Education, Higher Education and Employment Advancement, and Labor Committees.

    The board shall report biennially on progress made toward achieving the benchmarks in the strategic plan.

18. **C.G.S. Sec. 10-6b(g) shall be amended to require each constituent unit of the state system of higher education and the Board of Governors for Higher Education to submit strategies to improve performance and achieve results on unmet goals or performance measures as part of its annual accountability report to the commissioner, along with funding estimates for each proposed strategy. The commissioner of the Department of Higher Education shall include these strategies in its annual consolidated report to the Higher Education and Employment Advancement Committee. The commissioner shall also submit the report to the chairpersons and ranking members of the Commerce and Education Committees.**

19. **Beginning July 1, 2010, the Higher Education Coordinating Council shall review the accountability measures developed under C.G.S. 10-6(b)(g), and every five years thereafter, determine their continued validity, or need for revision. Any revisions or deletions shall be submitted to the Board of Governors for Higher Education for approval.**

    Upon BGHE approval, the commissioner of the Department of Higher Education, on behalf of the council, shall notify the committees of cognizance on any measures that were revised or deleted, with a brief explanatory statement.

    The Achieving Results Higher Education Counts report should include a letter grade or other symbol that represents, at a glance, whether or not the goal is being achieved.

20. **The Higher Education Coordinating Council should be reconstituted in accordance with C.G.S. Sec. 10a-6a.**

21. **Within available appropriations, a pilot program shall be established within the Department of Higher Education to be used at the discretion of the commissioner, to reward colleges, universities, or systems that are meeting pre-established goals.**

22. **The Office of Workforce Competitiveness, in consultation with the Connecticut Employment and Training Commission, the Departments of Higher Education, Education, Labor, and the Economic and Community Development, shall identify the sectors or sub-sectors in which career pathways need to be established, the workforce skills needed in those sectors, and the types of postsecondary programs that need to be developed to address the workforce needs in those sectors. The information shall be provided to the Board of Governors for Higher Education biennially.**

23. **Using information developed by the Office of Workforce Competitiveness, the Higher Education Coordinating Council shall make recommendations to the Board of Governors for Higher Education regarding postsecondary certificates and/or degree programs needed to address any shortages, or if existing programs lack capacity to address shortage areas.**

24. **The Connecticut Community College System, in consultation with the commissioners of the state Department of Education and the Department of Higher Education, and the superintendent of the Connecticut Technical High School system, shall examine the feasibility of transferring the adult education programs currently offered by the technical high schools, including the licensed practical nurse program, to the Connecticut Community College System.**

    The Board of Trustees for the Connecticut Community College System shall report to the legislative committees of cognizance on the feasibility of such a transfer including the cost of such transfer, the number of employees that would be impacted, and if such a transfer occurred, the geographic locations where the programs could be offered by October 1, 2010.

Introduction

Study Overview

Numerous reports have identified an increasing gap in how well Connecticut prepares its workforce for the demands of current and near-future employment. The Legislative Program Review and Investigations Committee voted to conduct a study examining the *Alignment of Postsecondary Education and Employment* in April 2009.[1] The focus of the study was to determine whether a formal alignment mechanism exists in Connecticut to match the production of skilled graduates from the state's higher education institutions (including public and independent universities, four-year colleges, and community colleges) with the current and projected workforce needs of the state's employers. The study also assessed current workforce supply and employer needs, and reviewed whether pathways exist for technical high school graduates to pursue postsecondary education certificates and degrees.

Because of the broad nature of the study, the committee decided to examine two areas in depth to see if there were successful state strategies that align postsecondary education with the needs of Connecticut's employers and could be applied to other occupational shortage areas. The two areas selected for intensive review were the emerging field of green collar jobs, and the nursing field, because the state had already implemented a number of strategies to increase the number of nursing graduates.

Table 1 shows a simplified version of the conditions and results of an employment market. Low labor supply and high employer demand together lead to employee shortages and the inability for markets to be fully productive, while high labor supply and low employer demand lead to unemployment. The purpose of promoting state policies that foster alignment is to achieve market equilibrium by ensuring an equal balance of supply and demand. If there were perfect alignment, individuals would become prepared for the workforce by obtaining a postsecondary degree or certificate and jobs requiring the skills obtained in college would exist. Figure 1 provides a diagram of the alignment of postsecondary education and employment.

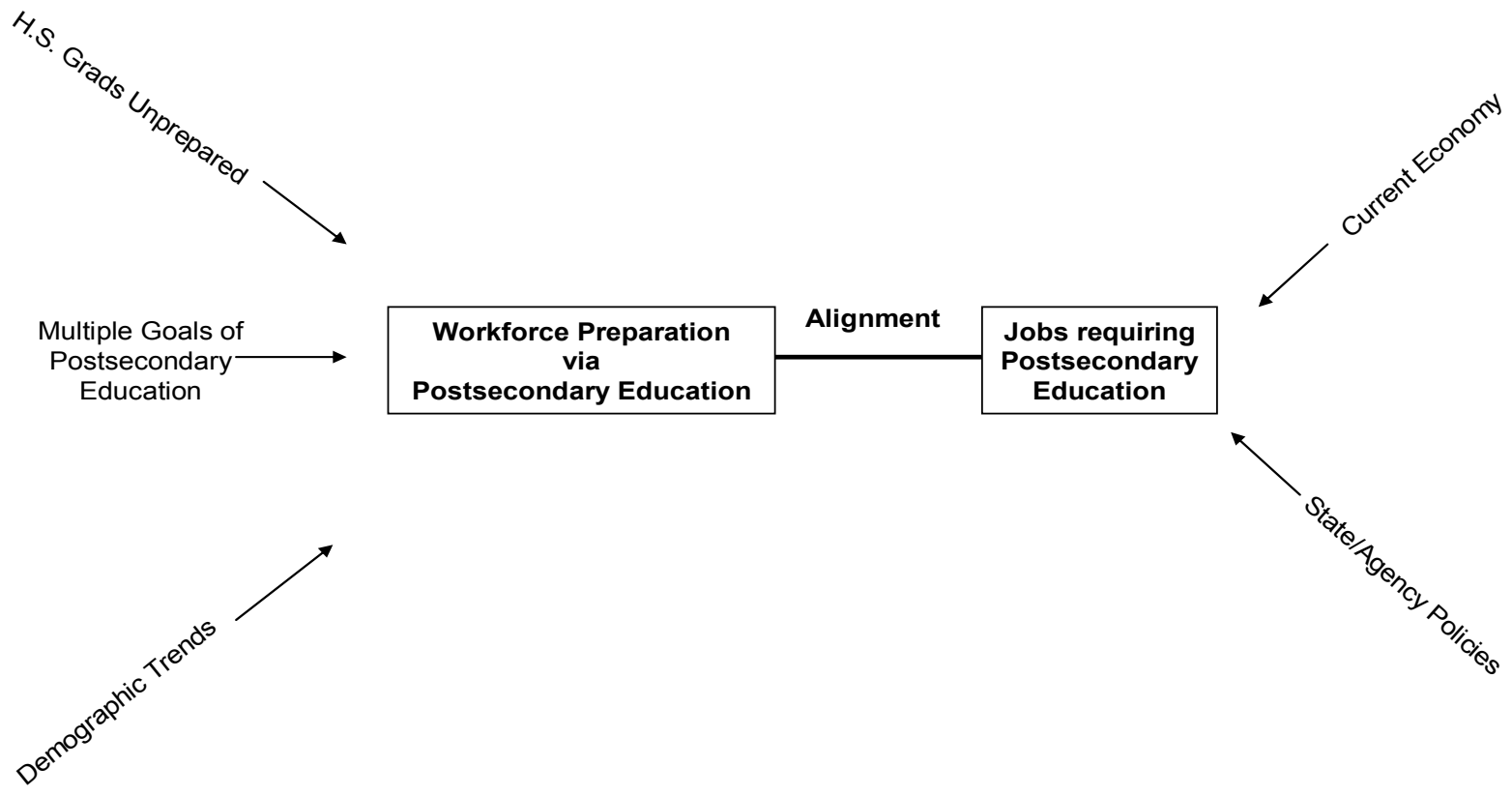
Table 1. Conditions Related to Labor Market Supply and Employer Demand

Labor Supply	***Employer Demand***	***Result(s)***
Misalignment		
low	high	employee shortages
high	low	unemployment
Alignment		
low	low	alignment
high	high	alignment

Source: PRI

[1] The American Dictionary (2nd College Edition) defines alignment "to adjust (parts of a mechanism, for example) to produce a proper relationship or condition."

Figure 1. Diagram Showing Alignment of Postsecondary Education and Employment



Source: PRI staff

The committee found an overall lack of alignment of postsecondary education and employment for a majority of the occupations examined. (Excluded from this alignment analysis were the many broad college majors that lead to employment in a multitude of occupations.) While some occupations appeared to be particularly well aligned, such as registered nurses, the majority of occupations examined seemed to have an oversupply or undersupply of workers.

The committee identified a number of barriers contributing to the misalignment of postsecondary education and employment. An increasing number of new college students are unprepared for college-level work and are enrolled in remedial or developmental courses. This lack of preparedness can be traced back to elementary and secondary schools, where a growing number of students as young as fourth graders do not score as well in science, math, and reading compared to students in other New England states. Additionally, there are difficulties in making accurate projections of demand for particular occupations ten years into the future. Further, Connecticut's system for public higher education was found to be very decentralized, with multiple boards of trustees, and funding allocated directly to the constituent units based largely on enrollment size rather than on results.

There are a number of factors affecting the supply of workers, as well as employer demand for labor. On the supply side, they include these facts:

- between 2004 and 2008, the percent of Connecticut high school graduates planning to attend college has fluctuated narrowly between 78-80 percent;

- many high school graduates, particularly at the community colleges, are unprepared for college-level work and need remedial English and math courses;

- there are multiple goals of postsecondary education, and creating a ready supply of workers for employers is only one of the many goals of the higher education system; and

- college students often are concerned not only with their own marketability in terms of their majors, but also on obtaining further education for their own personal growth.

Employer demand for workers is linked to economic cycles of various markets, increasing in boom times and decreasing in recession. In addition, other factors that influence employer demand for workers include:

- the introduction and adoption of new technology and productivity improvements;

- changing skill requirements; and

- state agency policies, such as financial and tax incentives or disincentives for businesses to locate in the state.

Connecticut's workforce trends. Today's global economy requires a highly dynamic, technologically advanced 21st century workforce. However, concerns about how Connecticut will meet these needs are twofold: 1) what are the workforce needs of Connecticut's employers now and in the future (demand); and 2) does Connecticut have a workforce that will meet these needs (supply).

The state will face a significant challenge to remain economically competitive given current demographic trends as described later in Chapter I and highlighted here:

- In general, New England states have had older populations than the rest of the United States for almost the last 30 years.

- The decreasing proportion of Connecticut residents in the traditional working age group of 25-64 may be mitigated by U.S. Census Bureau statistics showing an increasing proportion of employment for those who have reached what has traditionally been considered retirement age (65+ years old).

- Connecticut's increase in awarding bachelor's degrees outpaces national trends; however, Connecticut lags behind in the awarding of associate's degrees, and has experienced a 14 percent decrease in the awarding of postsecondary certificates from 2000 to 2006.

Additionally, Connecticut also must contend with changes in the types of employment opportunities available currently and in the near future. The manufacturing jobs that previously sustained the state's workforce fell 25 percent during the 1990s and those remaining require a different and more adaptable set of skills.[2] Further, community colleges in Connecticut estimate that almost 80 percent of new jobs will require training beyond high school.[3]

A 2008 survey by the Connecticut Business and Industry Association (CBIA) found that two-thirds of small and medium size businesses had difficulty finding qualified workers. The survey contained a number of questions related to business climate and growth in Connecticut, as well as questions related to the job-readiness of Connecticut's workforce. Of those employers that responded to a question on their greatest business concern over the next 12 months, 38 percent of employers were concerned about the price of energy, and 31 percent were concerned about the national economic uncertainties, while only 6 percent were concerned about the availability of skilled labor. Yet a later survey question more specifically asked if they were having trouble finding qualified workers, and the percentage responding "yes" increased to 61 percent.

Occupational projections. Current and future workforce needs are officially projected at the state and national level. This report identifies workforce needs within the next decade, as well as examines the accuracy of previous projections. The first step in linking postsecondary education to employer need is to identify the types of graduates that will be needed by

[2] The South Central Regional Workforce Development Board, *State of the Workforce 2003*.
[3] Connecticut Community Colleges, *Career Programs & 21st Century Skills*.

Connecticut's employers. The next step is to design academic programs around these needs if it is an emerging field or create incentives for students to enter certain fields where employers are experiencing a shortage of qualified workers.

The Department of Labor is the state agency responsible for developing 10-year occupation projections, including identifying those areas that will experience occupational shortages. Although almost all states use the same methodology to calculate these projections, there are also other private and public organizations projecting need at the national, state, and regional levels that employ a variety of strategies. More information about the process for determining employer demand is provided in Chapter II of this report.

History of alignment efforts. Postsecondary institutions play a critical role in the state's economic development because they supply employers with a skilled workforce. Although Connecticut's public and independent colleges and universities offer an array of certificate and degree programs, designing, offering, and marketing these programs to students in order to address employer need is often decentralized, with decisions made at the individual college level. This report discusses the many state agencies and boards with responsibility for some aspect of postsecondary education (supply) and employer needs (demand) and describes the current status of Connecticut's workforce.

Attention to the importance of the relationship between postsecondary education and employers is not new – proposals have been put forth by Connecticut's policymakers since at least 1982 with the creation of the Governor's Commission on Higher Education and the Economy. The commission's report cited the:

> *shortage of skilled labor in Connecticut and problems caused by poor academic preparation… Many cooperative programs are now underway among business, labor and education. But no framework currently exists to coordinate such efforts or to relate them to the educational needs of the state.*[4]

To create a better connection, the commission recommended improvements in career counseling, and the establishment of a committee to report on technological change and its effect on employment opportunities in Connecticut.

Ongoing alignment efforts. There has been a long-standing recognition that aligning postsecondary education with Connecticut's economy and employer need is important. Past and current efforts involve all the key players and progress has been made, albeit sometimes in a piecemeal manner. For example, a significant piece of legislation passed during the 2009 session requires a new longitudinal data system to track student success over the long term. In addition, the P-20 Commission, described later in this report, is examining how to better align prekindergarten through high school and higher education systems, as well as ways to foster better alignment between those systems and the needs of Connecticut's employers. Finally, a new Workforce and Education Cabinet was proposed in September 2009, in the Connecticut Economic Strategic Plan by the Department of Economic and Community Development.

[4] *Report of the Governor's Commission on Higher Education and the Economy*, January 1982, p. 2.

Roles and responsibilities of state entities. There are multiple organizations in state government that are mandated to foster linkages; the effectiveness of this "system" in aligning postsecondary education and employment, however, is unclear. Connecticut currently has multiple state agencies involved in projecting demand, identifying the current state of the workforce, and funding programs for a variety of workforce development initiatives. On the higher education side, there is a Board of Governors for Higher Education that statutorily serves as the coordinating body over four constituent units: the University of Connecticut, Connecticut State University System, Connecticut Community College System, and the Board for Academic Awards (i.e., Charter Oak State College and online distance learning). The technical high schools fall under the State Board of Education, Connecticut's governing board for K-12 public education.

Study Research methods. Background data were collected from various state agencies and relevant state statute were reviewed. Numerous studies concerning alignment of postsecondary education and employment were reviewed by committee staff, including ones specific to either New England or Connecticut. Best practices found in the literature were also reviewed and incorporated into recommendations to address various barriers, especially those pertaining to lack of preparedness of high school graduates for postsecondary education, delivery of remedial coursework, and retention of college students.

Program review committee staff conducted interviews with staff from: the State Department of Education (SDE); the Departments of Higher Education (DHE), Labor (DOL), Economic and Community Development (DECD), and Consumer Protection; and the Office of Workforce Competitiveness (OWC). Interviews were also held with college administrators and faculty at the University of Connecticut, the Connecticut State University System, and the Connecticut Community College System. On-site visits were made to: Central, Eastern, and Southern Connecticut State Universities; and Asnuntuck and Manchester Community Colleges, including a visit to the middle college, Great Path Academy, located at Manchester Community College. Committee staff also interviewed representatives from the Connecticut Conference of Independent Colleges, Goodwin College, and the Connecticut Business and Industry Association.

Information on relevant majors, programs offered, student enrollment, graduation rates, and passing rates on licensure exams were analyzed. Information relevant to the alignment of postsecondary education and employment was also gathered via a survey that was completed by 14 members of the Connecticut Conference of Independent Colleges. Questions encompassed a broad range of areas including remedial coursework, new additions and discontinuations of programs, placement rates post-graduation for nurses and engineers, and ways the Connecticut Department of Labor workforce shortage projections are used.

Also, data were gathered on the workforce supply including postsecondary graduates from Connecticut's public and independent postsecondary schools, and those currently employed in particular occupations. Information was also compiled on workforce demand, including occupational projections and job vacancy surveys. Based on these data, an assessment of the current and near-future alignment of supply and demand was conducted. Information on potential barriers to alignment was also compiled.

The in-depth examination of green collar jobs included interviews with representatives from the Connecticut Clean Energy Fund, Gateway Community College's Center for a Sustainable Future, Office of Workforce Development at the Interstate Renewable Energy Council (IREC), the Unit Coordinator for Trade Technologies for Connecticut Technical High Schools, and California Community Colleges' Centers of Excellence for Economic and Workforce Development. As part of the in-depth examination of nursing, information was collected from the University of Connecticut, the three universities in the Connecticut State University System with nursing programs, the Connecticut Community College System, the Connecticut Hospital Association, the Board of Examiners for Nursing, the Connecticut League for Nurses, and the Allied Health Workforce Policy Board.

Report Organization

Chapter I presents information on the current and future workforce supply in Connecticut. Chapter II describes employer demand, including a discussion of how demand is determined and a snapshot of jobs in greatest demand. Chapter III makes an assessment of the alignment between supply and demand by comparing numbers of graduates of postsecondary education and the estimated employer demand for this educated workforce. Chapter IV provides an overview of Connecticut's system of higher education and describes each of the constituent units that oversees Connecticut's public colleges and universities. Chapter V discusses the state agencies and other coordinating bodies that have been created to better link the higher education system to workforce development and employer need. Chapter VI discusses some possible barriers to the alignment of postsecondary education and employment and contains findings and recommendations towards overcoming them.

Chapter VII presents an in-depth examination of green collar jobs: what is driving the green movement; how green collar jobs are defined; who is developing the green collar field and where the job opportunities will be; and what green collar job education and training is being delivered. Chapter VIII describes the results of an in-depth examination of the nursing field and identifies successful strategies that were used to increase the number of students entering nursing programs, which could also be used for other occupational shortage areas.

Agency Response

It is the policy of the Legislative Program Review and Investigations Committee to provide agencies subject to a study with an opportunity to review and comment on the recommendations prior to publication of the final report. Appendix P contains responses submitted by the Office of Workforce Competitiveness and the Connecticut Employment and Training Commission, which were initially submitted as testimony for an October 2009 public hearing held by the PRI committee on the alignment study. The OWC director requested that the previously submitted testimony serve as the OWC and CETC responses to the final committee report. The Departments of Higher Education, Labor, and Economic and Community Development, and the State Department of Education did not submit responses.

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Chapter I

What is the Current and Near Future Workforce Supply in Connecticut?

As noted in the introduction, today's global economy requires a highly dynamic, technologically advanced 21st century workforce. Numerous reports have identified an increasing gap between Connecticut's workforce preparation and the demands of current and near-future employment. Does Connecticut have a sufficient supply of skilled and educated workers to meet the needs of employers?

This chapter addresses this question, beginning with a discussion of how supply figures are determined, and a snapshot of workforce industry and occupational areas. Information about the education and age of employees is also given as those factors impact the availability of a skilled and knowledgeable workforce.

How to assess the future supply of workers with postsecondary degrees or certificates is then discussed. Information on the talent pipeline is provided, including the number of high school graduates with plans to attend college, college graduation rates, and the most popular certificate and degree areas. The initial impact of college graduates on workforce supply is assessed using estimates of job placement rates in Connecticut within nine months of graduation.

Current Workforce Supply

How is current workforce supply determined? Prior to understanding if Connecticut has a sufficient supply of skilled and educated workers to meet the needs of employers, one must define what is meant by workforce supply. There is no consensus on how to measure current workforce supply. One way to describe the current workforce supply is to count how many people are employed in various *industry sectors* such as retail or government. A drawback to this methodology, however, is that it does not provide information about the kinds of occupations in which people are employed.

A second way to measure current workforce supply is to count how many people are working in broad *occupational sectors* such as office/administrative support or architecture/engineering. A challenge to this methodology is that occupational sectors employ people in many types of jobs that require different levels and types of education and training.

Because the focus of this study is on the alignment of postsecondary education and employment, the current workforce supply needs to be defined in terms of *specific occupations* such as pharmacists or automotive service technicians/mechanics. Particular occupations can then be matched with specific postsecondary degrees or certificates, as the third way to assess supply.

While the third methodology was used for this study, current workforce supply is briefly described in terms of industry and occupational sectors to provide a context for these future report analyses.

What are the industry/cluster sectors people are employed in? The federal and state Departments of Labor categorize industries using the North American Industry Classification System (NAICS). Table I-1 shows that, apart from government employees — mainly local government — the largest concentration of Connecticut's nonfarm workforce is employed in the trade, health care, and manufacturing sectors.

Table I-1. Industry Sectors In Which Connecticut Workers Are Employed

Industry Sector	Number Employed[a]	Percent of Total Employed
Government: federal, state, and local	254,100	15.4%
Trade: retail and wholesale	246,400	14.9%
Health care and social assistance	243,000	14.7%
Manufacturing	174,200	10.5%
Finance and insurance	120,100	7.3%
Accommodation and food services	114,300	6.9%
Professional, scientific & technical svcs.	88,000	5.3%
Other services	62,800	3.8%
Educational services	58,600	3.5%
Construction	54,800	3.3%
Transportation and warehousing	43,300	2.6%
Information	35,000	2.1%
Other (Misc.)[b]	158,800	9.6%
Total Nonfarm Employment	1,653,400	100%

[a]CT DOL workforce estimates exclude those in federal jobs, the military, self-employed, or living in Connecticut but working in another state.
[b]Examples of "Other" industry sectors include: arts, entertainment, and recreation; real estate and rental and leasing; and utilities.
Source: Connecticut Department of Labor, Labor Market Information on May 2009 employment by industry sector (www.ctdol.state.ct.us/lmi/ces/nfstatcm.htm)

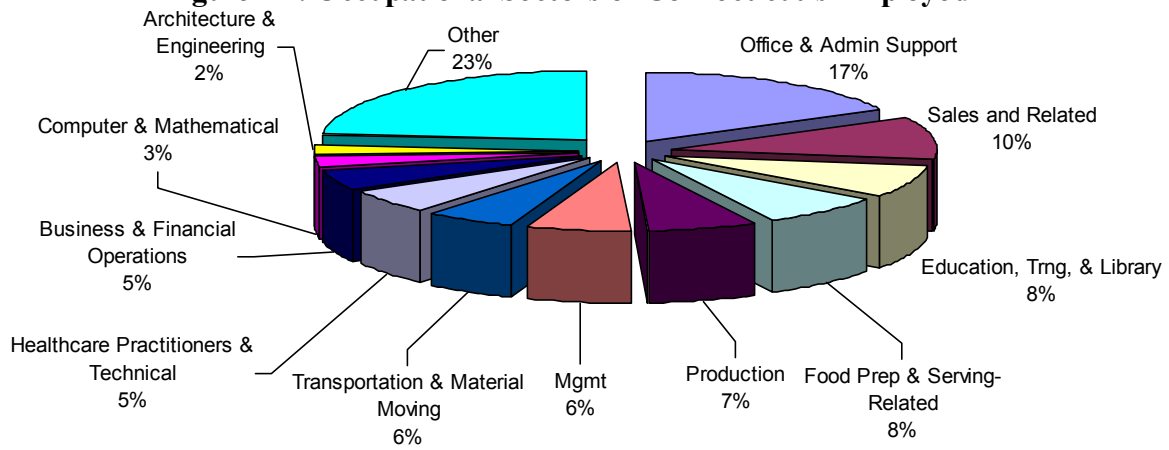
What occupational sectors are people employed in? According to the Connecticut DOL Occupational Employment Statistics (OES) survey, the state's current workforce consists of more than 1.6 million citizens employed in a variety of occupations. As shown in Figure I-1, more than one in four are employed in the office and administrative support occupational sector (e.g., secretaries, office clerks, and customer service reps) or the sales and related occupational sector (e.g., retail salespersons, cashiers, and sales reps), both typically considered lower paid and lower skilled occupational areas.

The computer and mathematical occupational sector (e.g., computer software engineers, programmers, and analysts) and the architecture and engineering occupational sector (e.g., civil, industrial, and mechanical engineers and technicians), key areas for the new global economy, make up less than five percent of Connecticut's workforce.

The occupational sectors in the "other" category include: life, physical, and social science occupations (e.g., biochemists, and physicists) (1%); community and social services occupations (e.g., probation officers, medical, and public health social workers) (2%); legal occupations (1%); arts, design, entertainment, sports, and media occupations (2%); healthcare support occupations (e.g., dental assistants, and medical transcriptionists) (3%); protective service

occupations (2%); buildings and grounds cleaning and maintenance occupations (4%); personal care and service occupations (e.g., fitness trainers and aerobics instructions) (3%); farming, fishing, and forestry occupations (<1%); construction and extraction occupations (4%); and installation, maintenance, and repair occupations (4%).

Figure I-1. Occupational Sectors of Connecticut's Employed



Source: CT DOL Office of Research, *Connecticut Occupational Employment & Wages Statewide 2009*

What is the education of the workforce? The educational qualifications of Connecticut's workforce are important because this study focuses on the alignment of supply and demand for jobs that require postsecondary education. The Connecticut Employment and Training Commission recently called for all Connecticut workers to have "access to and acquire the equivalent of at least two years of education or training beyond high school, leading to an associate's degree, a comparable vocational credential, or similar industry certification…"[5] Although there may be some question about the alignment of postsecondary education and employment, Connecticut is well-positioned to meet this overall education challenge. Table I-2 shows that Connecticut is ranked fifth in the U.S., ahead of all New England states but Massachusetts, in the percent of heads of households with at least four years of college.

Connecticut's strong position is further enforced by the 20 percent increase in the number of postsecondary education degrees and certificates[6] awarded in Connecticut during the five-year period between state FYs 01 and 06. Figure I-2 shows the largest increase was for bachelor's degrees (27 percent). With the exception of the Connecticut community colleges, there was an overall decrease (14 percent) in postsecondary certificates.[7] Encouraging people to enroll in and

[5] Connecticut Employment and Training Commission, "2009 Annual Report/Card: A Talent-Based Strategy for Economic Competitiveness."

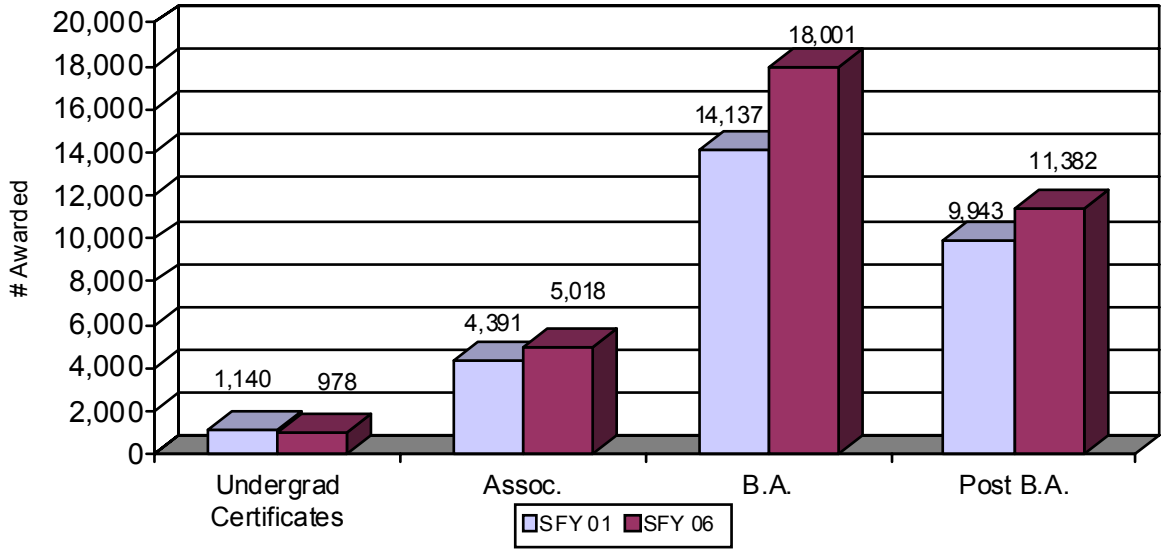
[6] A certificate is an academic credential earned through programs of shorter duration than an associate's degree, varying from three to 45 credits of training (e.g., Lean Manufacturing or Paralegal) or credit-free training (e.g., Certified Nurse Aide).

[7] Postsecondary education certificates awarded by the Connecticut Community College System alone, however, increased during the period from 2001 to 2006 by approximately 12 percent, from 745 to 831 certificates. (Source: Personal communication, Mary Anne Cox, Assistant Chancellor, Connecticut Community College System, October 20, 2009.)

graduate from certificate programs is extremely important because such programs provide the education and training that is necessary for many of the jobs in the "middle skill" areas.[8]

Table I-2. Percent of Heads of Households with at Least Four Years of College, 2005-2007		
State	**Ranking**	**Percent**
District of Columbia	1	45.4%
Massachusetts	2	37.1%
Maryland	3	34.7%
Colorado	4	34.6%
Connecticut	**5**	**34.3%**
New Jersey	6	33.7%
Virginia	7	32.9%
Vermont	8	32.7%
New Hampshire	9	31.8%
New York	10	31.2%
Rhode Island	13	29.4%
Maine	25	25.9%
Source: 2005-2007 American Community Survey Three-Year Estimates		

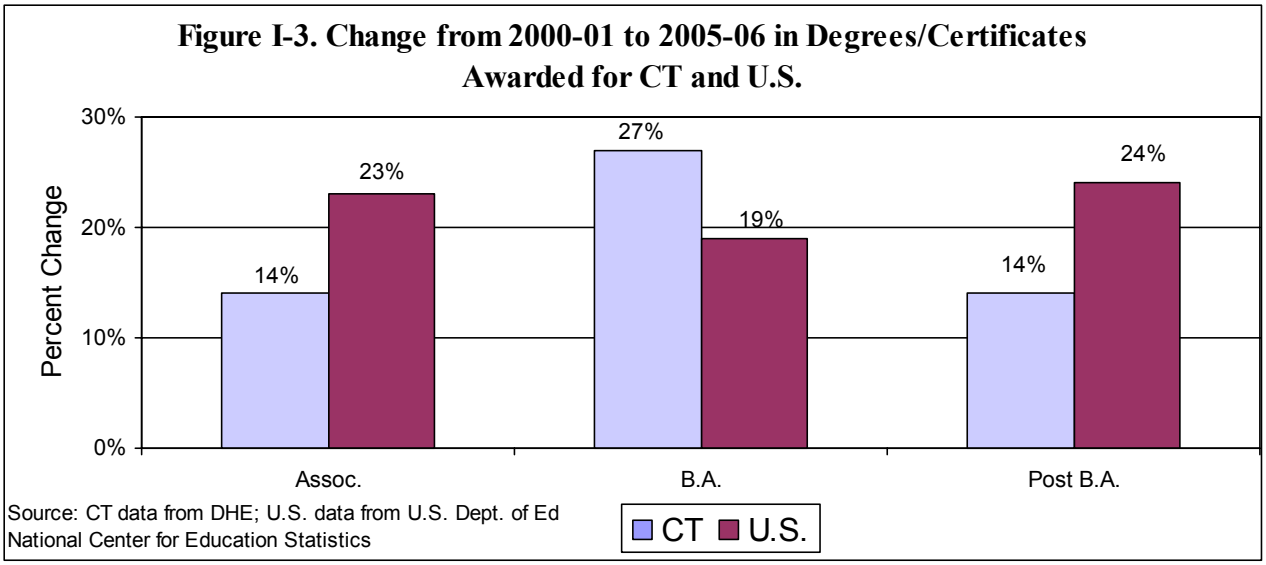
Figure I-2. CT Degrees and Certificates Awarded in SFY 01 vs. SFY 06



Source: State of Connecticut Department of Higher Education February 2009 Report, "2007-2008 Degrees Conferred by Connecticut Institutions of Higher Education"

Connecticut's increase in the award of bachelor's degrees outpaces national trends (Figure I-3). However, compared with the U.S., Connecticut has made less progress in awarding associate's degrees and advanced degrees beyond the bachelor's degree.

[8] A "middle-skill" job is one that requires education or training beyond high school, but not a four year degree.



What is the age of the workforce? The age distribution of a state's population has important implications for the availability of workers. An older population is more likely to have retired citizens and thus represent a shrinking available workforce for employers. Connecticut is considered to have one of the oldest populations in the United States. Table I-3 shows the 10 states with the highest median age. Connecticut and four other New England states all have populations that are among the oldest in the country (Massachusetts has the 11 highest median age, 38.6).

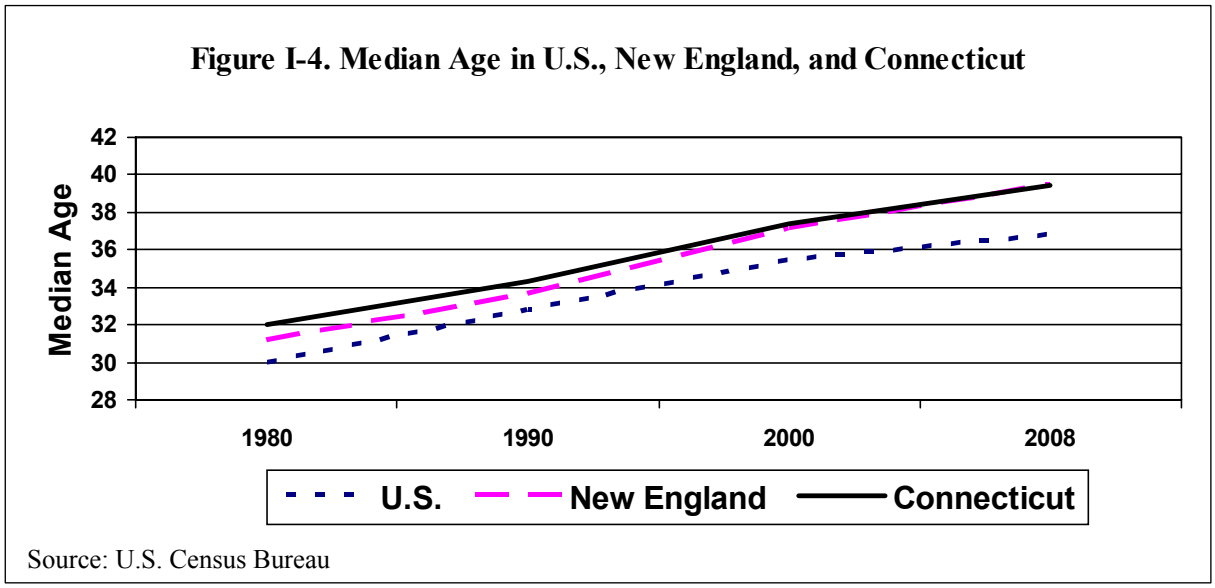
Table I-3. Median Age Ranking for "Oldest" States as of July 2008

Rank	Median Age	State
1	42.0	Maine
2	41.2	Vermont
3	40.6	West Virginia
4	40.2	Florida
4	40.2	New Hampshire
6	39.9	Pennsylvania
7	**39.4**	**Connecticut**
8	39.3	Montana
9	38.8	Rhode Island
10	38.7	New Jersey

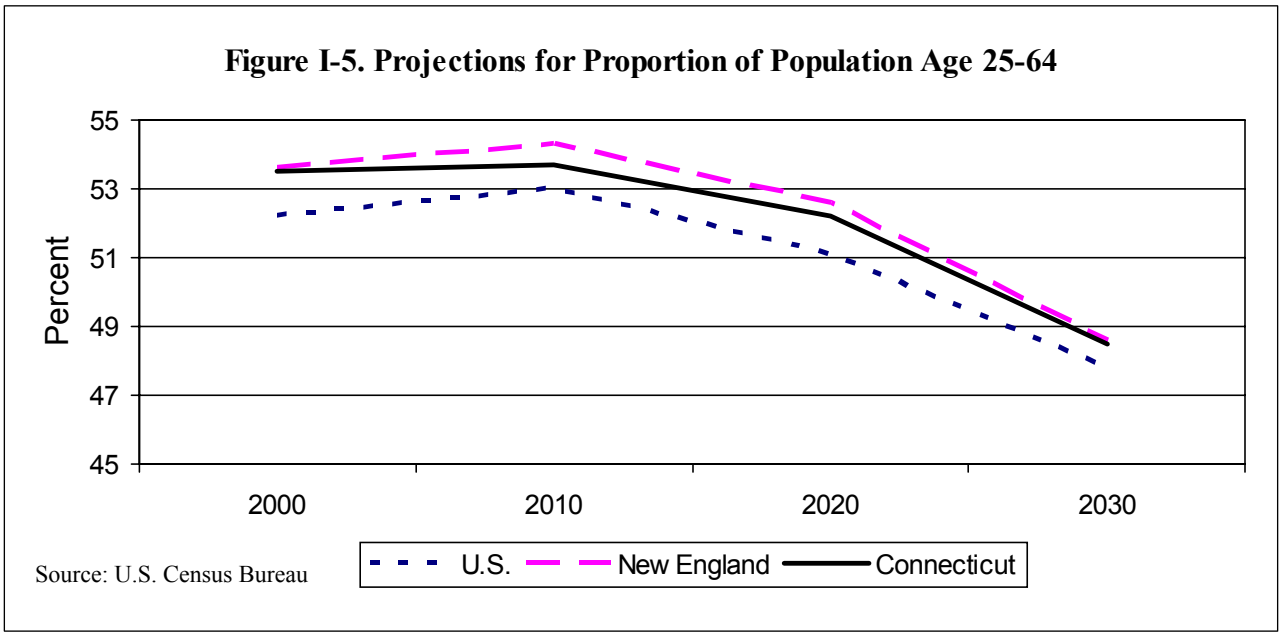
Source: July 1, 2008 U.S. Census Bureau estimates

Is this a new problem? In general, New England states have had older populations than the rest of the United States for almost the last 30 years. Figure I-4 shows the median ages since 1980. Overall, the country has been aging, with a similar trend found in New England and Connecticut. While Connecticut was ranked the fourth oldest state in 1980, it has actually dropped to the seventh oldest state, behind Maine, Vermont, and New Hampshire, as of the July 2008 U.S. Census estimates. Although the relatively older median age of Connecticut citizens is

not a new development, its impact on the proportion of the state's working age population still needs to be examined.

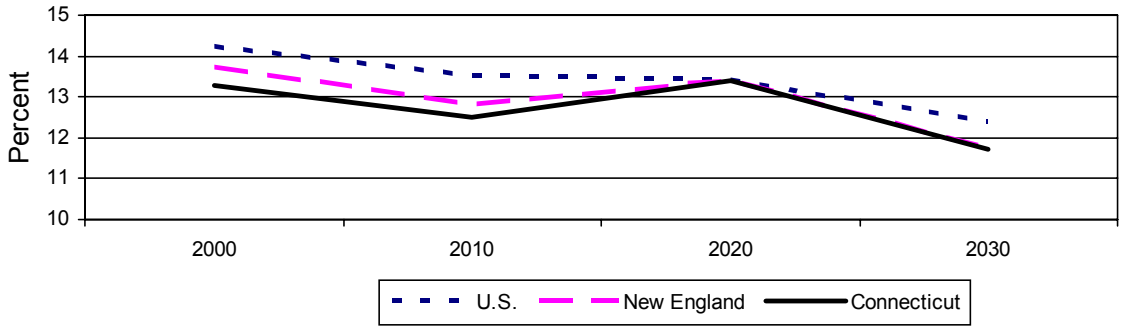


How much of Connecticut's population is of working age? Residents in the 25-64 year old age range are considered the primary working age population of a state. According to the U.S. Census 2005-2007 American Community Survey 3-Year Estimates, Connecticut has 1,878,887 residents in the 25-64 year old working-age population. Figure I-5 shows projections for the proportion of Connecticut residents age 25-64. The decreasing state trend is similar to that of the nation and all New England states.



A closer examination of projections of the size of Connecticut's "young adult" or "young professional" population (i.e., 25-34 year olds) shows a slight increase from 12.5 to 13.4 percent during the next decade (Figure I-6). This trend contrasts with the relatively flat national trend for this same age group. Connecticut is projected to join New England in doing worse than the U.S. trend of fewer young professionals, however, in the subsequent decade. Beyond population trends in the traditional working age groups, one can examine the proportion of residents who are actually employed.

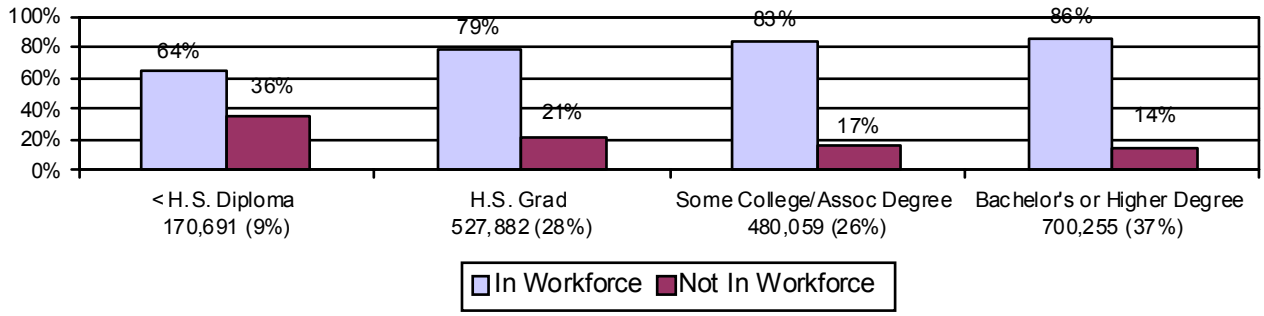
Figure I-6. Projections for Proportion of Population Age 25-34



Source: U.S. Census Bureau

How much of Connecticut's population is employed? Approximately 81 percent of working age residents are actually in the labor force and of those, two-thirds (66 percent) have at least some college (Figure I-7). Approximately 17 percent of working age Connecticut residents with some college or an associate's degree, and 14 percent with at least a bachelor's degree, are *not* currently in the workforce and may be a source of new workers. There are also more than 79,000 Connecticut residents age 65 and over who are still working (approximately 16 percent of the 65+ age group).

Figure I-7. Proportion of 25-64 Year Old Connecticut Residents In or Out of the Workforce

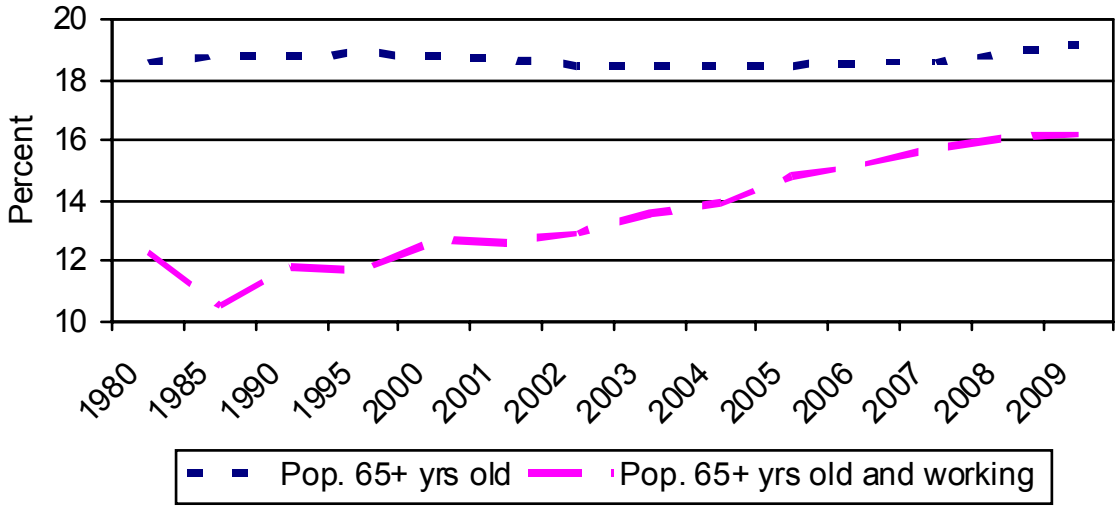


Source: U.S. Census 2005-2007 American Community Survey 3-Year Estimates

Nationally, since the year 2000, an increasingly larger percent of the 65 years and older population is working. Thus, the decrease in the 25-64 year old population may be mitigated by

U.S. Census Bureau statistics showing an increasing proportion of employment for those who have reached what has traditionally been considered retirement age (Figure I-8). However, no data were available on the types of jobs they are filling (e.g., low skilled vs. high skilled).

Figure I-8. Proportion of U.S. Population 65+ Years Old[a] and Workforce Participation by those 65+ Years Old



[a] Civilian noninstitutional population, percent out of 25+ year olds.
Source: U.S. Census Bureau

At a 2008 conference on meeting New England's skilled workforce needs,[9] the role that older workers can play over the coming decades was explored. It was noted that the strong link between educational attainment and labor force participation for 55-74 year olds will be beneficial to the region, given New Englanders have the highest education level in the nation.

Near Future Workforce Supply

How is the near future workforce supply determined? Before assessing whether Connecticut is producing an adequate supply of new skilled and educated workers to meet employer demands, one must decide how to measure this new workforce supply. As was the case with measuring the current workforce, there is also no consensus on how to measure the near future workforce supply for jobs requiring postsecondary education. One strategy for making these projections is to look at the number of *high school graduates with plans to attend college*, a statistic gathered by the Connecticut State Department of Education. This provides information about the talent pipeline; however, a complicating factor is that high school graduates may change their plans or delay enrollment.

Another way to predict near future workforce supply is to look at the actual number of *degrees or certificates conferred by Connecticut institutions of higher education*. This

[9] *Employing the Region's Assets: Baby Boomers Meeting New England's Skilled Workforce Needs*. New England Public Policy Center of the Federal Reserve Bank of Boston, December 3, 2008, Conference Report 08-1.

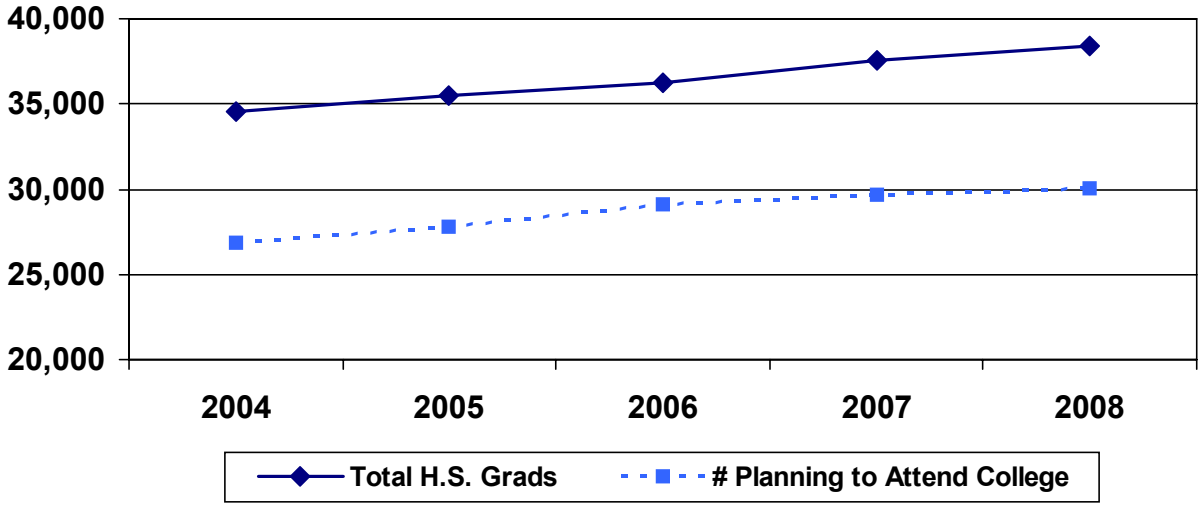
information is fairly readily available for students who receive their postsecondary education in-state, particularly at a public institution, but more difficult to discern for students who receive their education outside of Connecticut.

In addition to looking at the actual number of graduates, state of residence plays a role in determining if they will remain in Connecticut and join the workforce. As will be described, Connecticut high school graduates who attend college in Connecticut are more likely to remain in the state upon degree or certificate completion than are non-Connecticut residents. Given these cautions in interpreting the data, information on near future workforce supply is now provided.

Number of recent high school graduates with plans to attend college. The previously-mentioned talent pipeline stretches from preschool through postsecondary graduate school education. As discussed earlier, Connecticut's highly skilled jobs require workers with postsecondary degrees or certificates. Entry into postsecondary education necessitates a high school diploma (or GED) and a plan to attend college.

The Connecticut State Department of Education gathers statistics on the number of high school graduates and the percent planning on attending college. While the numbers of high school graduates and those planning to attend college have both increased approximately 11 percent from 2004 to 2008 (11.1 percent and 11.6 percent, respectively), the percent planning on attending college has remained relatively stable, fluctuating narrowly between 78-80 percent of high school graduates (Figure I-9). Thus, there are more recent high school graduates planning on attending college due to the *higher number* of high school graduates rather than due to *proportionately more* high school seniors planning on attending college.

Figure I-9. Connecticut High School Graduates Planning on Attending College



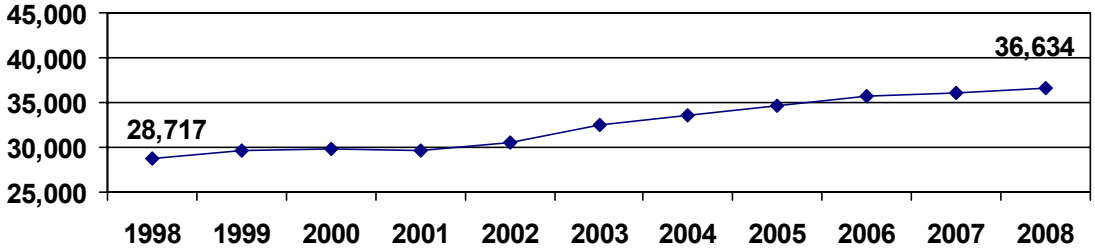
Source: Connecticut State Department of Education www:csde.state.ct.us/public/cedar/cedar/grads/index.html

As noted earlier, one caution in interpreting this data is that while the percents reflect students with *plans* to attend college, it does not confirm that the students followed through and actually enrolled in college that fall. Connecticut currently does not have a longitudinal data system to chart student advancement through postsecondary entry. There are 28 states with the ability to match student records between P-12 and postsecondary systems, and with recent funding from the U.S. Department of Education, the Connecticut State Department of Education and Department of Higher Education will soon be able to develop such a data system.

Another measure of future workforce supply is *actual* number of degrees or certificates conferred by Connecticut postsecondary education institutions.

Number of certificates/degrees conferred by Connecticut colleges. The students completing degrees or certificates from postsecondary institutions are poised to enter occupations for which they have been trained. Not all of these graduates are new to the workforce. A sizable number of community college students, for example, are employed while obtaining their educations. Figure I-10 shows a 28 percent increase in the past decade in the number of degrees and certificates conferred by Connecticut colleges.

Figure I-10. Number of Degrees/Certificates Conferred in Connecticut



Source: CT Dept. of Higher Ed. *2007-08 Report on Degrees Conferred by CT Institutions of Higher Education*

The supply of near future workers is influenced not only by the number of postsecondary degrees or certificates awarded, but also by decisions to remain in or leave Connecticut following graduation. Residency status is a key predictor of whether the graduate stays or leaves the state, which in turn is associated with whether the institution is public or independent.

Types of institutions producing the near future workforce supply. Table I-4 shows the number of students who graduated in 2008 from Connecticut public and independent colleges and the proportion who were Connecticut residents. This latter information is useful in projecting the near future workforce supply because while it is estimated that just 20 percent of those who had migrated into the New England region to attend college were still living there one year after graduation, more than 90 percent of native graduates had remained.[10]

[10] New England Public Policy Center at the Federal Reserve Bank of Boston, *March 2009 Policy Brief.*

The state's four national independent colleges (Connecticut College, Trinity College, Wesleyan University, and Yale University) draw students from around the country, and have a relatively small percentage of Connecticut residents enrolled. In contrast, almost half of the students enrolled in the state's 18 more regionally oriented independent colleges (e.g., Quinnipiac University, University of Hartford, University of New Haven, and Sacred Heart University) are Connecticut residents.

Table I-4. Statistics on 2008 Graduates from Connecticut Colleges

Type of Institution	Number of 2008 Graduates	Percent Estimated to be CT Residents[b]	Number of Graduates Estimated to be CT Residents
Public Postsecondary Education Systems[a]:	**19,030**	**86%**	**16,377**
CT Community College System (12 community colleges)	4,804	99%	4,756
CT State University System (4 state universities)	6,870	91%	6,277
University of Connecticut	6,875	75%	5,156
Charter Oak State College	481	39%	188
Independent Postsecondary Education Institutions	**17,381**	**45%**	**7,859**
National Independent Colleges (4 institutions)	5,808	12%	697
Regional Independent Colleges (18 institutions)	10,982	47%	5,162
Two-Year Independent Colleges (5 institutions)	591	94%	556

Sources: State of Connecticut Department of Higher Education, *2007-08 Report on Degrees Conferred by Connecticut Institutions of Higher Education*.
[a]*Higher Education, Building Connecticut's Workforce Report on 2006-07 graduates, April 2009*.
[b]State of Connecticut Department of Higher Education, 2009 Report, *Higher Education Counts: Achieving Results*.

Number of graduates by major/occupation areas. Until this point, attainment of a postsecondary degree or certificate has been discussed in general terms, regardless of the field of study. As will be seen in Chapter III, many employers require positions to be filled by candidates who majored in particular areas. Table I-5 shows the most common majors across Connecticut higher education institutions for 2008 by certificate/degree level. Certificate and degree areas at the undergraduate level are most often awarded in business, management, marketing, and related support services as well as health professions and liberal arts. Business and education areas are popular among master's level degrees, and doctorates and professional degrees were commonly awarded in the legal and health areas.

Table I-5. Most Popular Certificate and Degree Areas for 2008 Graduates	
Certificate/Degree Level	**Most Popular Certificate/Degree Areas at Connecticut Public and Independent Postsecondary Institutions**
Certificate (N=1,099)	• Business, Management, Marketing, and Related Support Service (253) • Health Professionals and Related Clinical Sciences (229) • Engineering Technologies/Technicians (154)
Associate's Degree (N=5,085)	• Liberal Arts and Sciences, General Studies, and Humanities (1,750) • Health Professions and Related Clinical Sciences (1,105) • Business, Management, Marketing, and Related Support Service (1,016)
Bachelor's Degree (N=18,930)	• Business, Management, Marketing, and Related Support Service (3,221) • Social Sciences (2,390) • Psychology (1,488) • Health Professionals and Related Clinical Sciences (1,388)
Master's Degree (N=9,613)	• Education (2,776) • Business, Management, Marketing, and Related Support Service (1,898) • Health Professionals and Related Clinical Sciences (1,012)
Doctoral/Professional Degree (N=1,716)	• Legal Professions and Studies (513) • Health Professionals and Related Clinical Sciences (352) • Biological and Biomedical Sciences (133)
Source: CT Dept. of Higher Ed. *2007-08 Report on Degrees Conferred by CT Institutions of Higher Education*	

Placement rates of Connecticut graduates in Connecticut jobs. Placement rates of 2007 graduates from Connecticut public postsecondary institutions were used as a general indicator of new entries into the Connecticut workforce. Table I-6 shows that approximately seven in ten graduates from such institutions were employed in Connecticut within nine months of graduation. Similar aggregate information was unavailable for the 27 independent colleges.

Table I-6. Employment of 2007 Connecticut Graduates of Public Postsecondary Institutions			
Postsecondary Institution Category	**Number of Graduates**	**Employed in CT within 9 Months of Graduation**	
		Number Employed	**Percent of Graduates**
Community College System	4,691	3,611	77%
CT State University System	6,363	4,947	78%
University of Connecticut	6,282	3,739	60%
Charter Oak State College	592	181	31%
Total	17,928	12,478	70%
Source: *Higher Education: Building Connecticut's Workforce; Report on 2006-07 Graduates*, April 2009			

Chapter II

What is the Employer Demand?

Employers must have well-educated, technologically advanced workers in order to compete in today's knowledge-based economy. Unmet employer need may result in companies moving jobs out of Connecticut or failing to compete effectively, thereby creating a serious barrier to the prosperity of Connecticut's economy.

Meeting employer demand is beneficial not only to employers and the state's economy, but also to the current and future workforce as the resulting jobs allow people to be self-sufficient citizens. The alignment of postsecondary education and employment is especially important in meeting employer demand because educational institutions are a valuable resource for producing new workers in shortage areas.

To assess whether postsecondary education and employment are aligned, it is necessary to understand employer demand now and in the near future. As is the case with workforce supply, there is more than one way to define employer demand for various occupations, including the *rate of job growth, amount of job growth, and number of job openings*. Employee demand information is regularly gathered and available on the Connecticut DOL website.[11]

This chapter begins with a discussion of how employer demand is determined by the Connecticut DOL and reviews the jobs in greatest demand. There are also emerging fields that are anticipated to require a trained workforce in the not-too-distant future, and will need postsecondary institutions to respond by creating tailored programs to meet this new employer demand. The green collar jobs discussed in Chapter VII are an example of an emerging field.

Job vacancy information is another way to assess employer demand. General and targeted studies of job vacancies were conducted within the past five years by the: Connecticut Department of Labor (representative survey of most occupations in Connecticut); Connecticut State Department of Education (annual report on the number of applicants and remaining vacancies for particular teacher job openings); and Connecticut Hospital Association (vacancy rates for nurses and allied health professions in 29 acute care hospitals). Jobs with the highest and lowest vacancy rates are also identified in this chapter.

How is Employer Demand Determined?

In order for postsecondary education institutions to align degree and certificate programs with employer needs, the institutions need to know where the job demand is now and in the near future. The Connecticut DOL updates 10-year projections every two years on the jobs that will be in demand in the coming decade. Projections are based on information obtained from the Occupational Employment Statistics (OES) Survey, a twice-yearly mailed questionnaire to business establishments on occupational employment and wage rates.

[11] http://www.ctdol.state.ct.us/lmi/misc/occsindemand.htm

There are 280 industry-specific versions of the OES survey, and depending on the particular business establishment, the form contains a grid of anywhere from 50 to 225 relevant occupational titles, grouped by occupational division, with twelve wage ranges and a total column. Employers are voluntarily asked to record the number of workers (by wage range) *currently employed* in each of the occupations (vacancies are excluded). All states use this surveying methodology and forward their results to the U.S. DOL, where the individual state data is then compiled into national projections of workforce needs.

Out of the approximately 101,000 employers in Connecticut, a total of 3,500 representative employers are sampled in May and November of each year. The state's OES response rate for the May 2007 survey was 77 percent, above the 75 percent survey return rate required by the U.S. Bureau of Labor Statistics. (See Appendix A for more details on the sampling methodology).

Based on the OES results, high demand occupations are identified in one of three ways by Connecticut DOL:

- fastest growing: the *percent increase* in the number working in the occupation now and within 10 years;
- largest job growth: the *increase in the number employed* in the occupation 10 years from now; and
- most openings: *greatest number of annual openings* projected, taking into consideration such factors as retirements and creation of new jobs.

The Connecticut state labor economist reported using "most openings" OES data as the basis for developing the employer demand projections published in the DOL biennial report, *Soaring to New Heights*, and is the definition used in this PRI study. Other factors taken into consideration by the state labor economist in developing the employer demand projections include: overall demographics and population changes/growth; and information from other state agencies, such as the State Department of Education (SDE), that impact employment projections.

The Connecticut DOL staff interviewed reported that employer demand projections are more an art than a science, noting how difficult it is to accurately project job openings 10 years into the future. At any point during the 10-year period, major economic upheavals or introductions of new technologies could produce substantial deviations from the projections.

The *Soaring to New Heights* report is expected to provide a snapshot of jobs in greatest demand by training level and is not intended to comprehensively describe the job outlook for all 800+ occupations included in the OES survey. However, the publication was recently reduced from six to four pages to save paper, and therefore, money; in doing so, information on teacher occupations in demand was eliminated.

Table II-1 shows that, when all occupations requiring postsecondary education are considered, teachers are among the occupations with the greatest projected number of annual job openings for the years 2006-2016. As will be seen in Chapter III, while the projected number of job openings is an important factor in determining demand, it must be balanced with available supply. Elementary school teachers, for example, are among the occupations with the greatest

projected number of job openings in Connecticut; however, they are not considered a shortage area by the State Department of Education because of the large number of graduating students in Connecticut becoming certified in elementary education.

Table II-1. Occupations with Greatest Projected Number of Job Openings in Connecticut (2006-2016)

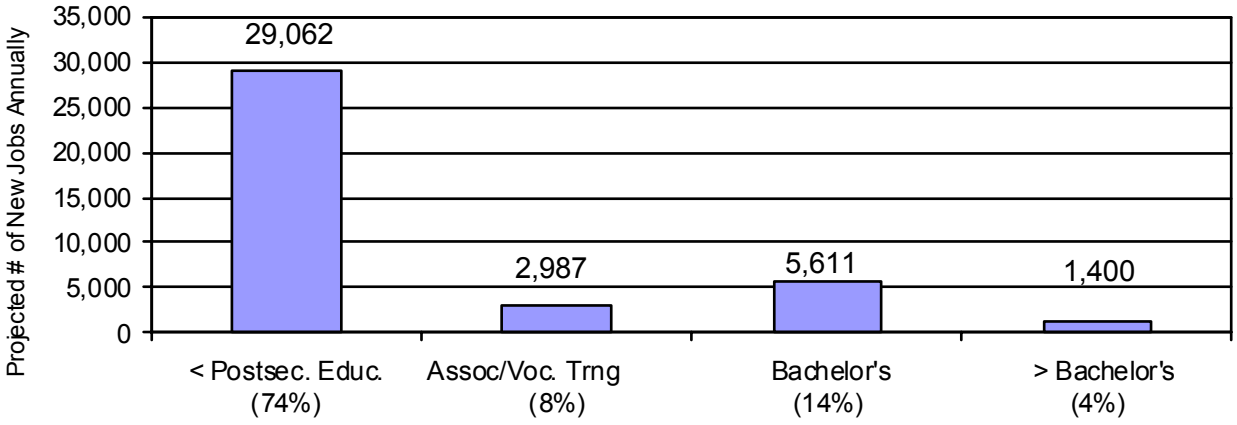
Occupation	Annual Openings Projected
Registered Nurses	1,114
Accountants and Auditors	683
Elementary School Teachers, Except Special Education	608
General and Operations Managers	479
Computer Systems Analysts	450
Secondary School Teachers, Except Special and Voc. Ed.	432
Computer Software Engineers, Applications	356
Licensed Practical and Licensed Vocational Nurses	324
Middle School Teachers, Except Special and Voc. Ed	319
Computer Support Specialists	307
Management Analysts	300

Source: CT DOL Office of Research Labor Market Information
www.ctdol.state.ct.us/lmi/misc/mostopen.htm

What Education will be Needed for Jobs in Greatest Demand?

While many of the technologically advanced jobs in today's economy require a college degree or certificate — the focus of this study — most jobs in demand do not require any postsecondary education. Almost three-quarters (74 percent) of the 39,060 projected annual openings in the *Soaring to New Heights* high demand areas (i.e., occupations with the greatest projected number of job openings in Connecticut) do not require any postsecondary education (e.g., cashiers, retail salespersons, waiters/waitresses, and customer service representatives) (Figure II-1).

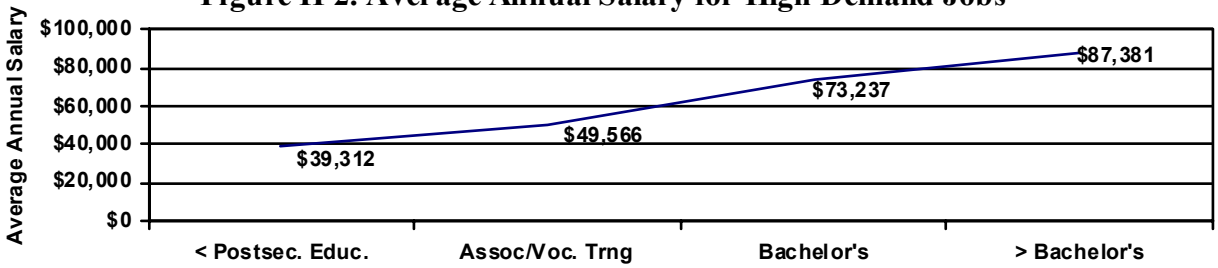
Figure II-1. Education Level Required for Jobs in High Demand



Source: Soaring to New Heights: Connecticut Job Outlook by Training Level (2006-2016), Connecticut Department of Labor, November 2008

While there are many openings for jobs requiring less than postsecondary education, Figure II-2 shows their relatively low salaries, which may be inadequate to met basic needs in Connecticut.

Figure II-2. Average Annual Salary for High Demand Jobs



Source: *Soaring to New Heights: Connecticut Job Outlook by Training Level (2006-2016)*, CT DOL, Nov. 2008

Jobs in greatest demand as they relate to income needed to meet basic needs in Connecticut. To better understand what income is required to meet basic needs in Connecticut, average annual salaries can be compared the state's "self-sufficiency standard." Connecticut is statutorily required to calculate the "…income an employed adult may need to meet his family's needs, including, but not limited to, housing, food, day care, transportation and medical costs."

Table II-2 shows the minimum income required for a family in Connecticut of a given composition to adequately meet its basic needs without public or private assistance. The average annual salary for jobs in high demand that do not require any postsecondary education is insufficient to adequately support many of the families with one or more children.

Table II-2. Self-Sufficiency Standards for Certain Family Types in Selected Connecticut Cities, Metro Areas and Regions, 2008

Jurisdiction	Adult	Adult + Infant	Adult + Preschooler + School age	2 Adults + Preschooler + School age
Greater Waterbury	$26,099	$48,122	$62,900	$69,526
Greater Danbury	$26,383	$48,672	$63,530	$69,994
Northwest Corner	$20,485	$40,659	$55,312	$61,958
Bridgeport	$17,362	$38,234	$54,610	$57,899
Upper Fairfield (high, Adult)	$29,536	$53,152	$70,257	$76,415
Hartford (low, Adult)	$16,146	$34,873	$48,713	$51,847
Hartford Suburbs	$23,472	$43,678	$58,012	$64,915
North Central	$22,576	$42,330	$56,785	$63,814
New Haven	$17,357	$36,271	$50,128	$52,943
Upper Connecticut River (median, Adult)	$22,238	$42,105	$56,372	$62,971
Greater New Haven	$23,757	$43,562	$57,859	$64,837
Greater New London	$21,073	$36,995	$48,432	$54,754
Northeast Corner	$18,928	$35,309	$46,496	$52,908
Median	**$22,238**	**$42,105**	**$55,312**	**$62,971**

Sources: *The Real Cost of Living in 2005: The Self-Sufficiency Standard for Connecticut* (http:www.wowonline.org/ourprograms/fess/state-resources/Connecticut.asp)
Permanent Commission on the Status of Women, *Wider Opportunities for Women: The Self-Sufficiency Standard for Connecticut*. (Values inflated to 2008 using Department of Labor Consumer Price Index)

In addition, there are some high demand jobs *requiring postsecondary education* that have salaries insufficient to meet basic needs. Table II-3, for example, shows occupations such as preschool teachers and library technicians that require postsecondary education and are considered in high demand, but have relatively low salaries that are insufficient to meet the median basic needs in Connecticut for even a single adult.

Table II-3. CT DOL Classified High Demand Occupations with the Highest and Lowest Projected Annual Minimum (entry) Salaries

Occupations with Highest Salaries		**Occupations with Lowest Salaries**	
Occupation	Salary	Occupation	Salary
Family and General Practitioners	$80,766	Fitness Trainers and Aerobic Instructors	$19,115
Pharmacists	$79,061	Preschool Teachers, except Special Education	$19,261
Veterinarians	$73,237	Library Technicians	$19,843
Computer and Information Systems Managers	$69,701	Veterinary Technologists and Technicians	$23,254
Lawyers	$58,864	Automotive Service Technicians/Mechanics	$24,710
Computer Software Engineers, Applications	$58,323	Rehabilitation Counselors	$25,834
Medical and Health Services Managers	$57,782	Medical Records and Health Info. Technicians	$26,042
Computer Software Engineers, System Software	$57,616	Emergency Medical Technicians and Paramedics	$26,125
Financial Managers	$56,846	Real Estate Sales Agents	$26,395
Computer Systems Analysts	$56,014	Business Operations Specialists	$26,437
		Mental Health Counselors	$26,645

Source: *Soaring to New Heights: Connecticut Job Outlook by Training Level (2006-2016)*, Connecticut Department of Labor, November 2008 (Annual wage calculated using minimum hourly wage x 40 hrs per week x 52 weeks)

The focus of this study is on occupations requiring postsecondary education *and* paying salaries that are sufficient to meet basic needs in Connecticut, and occupations that do not meet these criteria are excluded from further analysis. Additionally, there are other high demand occupations requiring postsecondary education (such as veterinary technologists and technicians, medical records and health information technicians, and emergency medical technicians and paramedics) with average entry level salaries below the self-sufficiency standard needed for single parents,[12] a factor for parents to consider when selecting postsecondary education and training programs.

[12] Considering the smallest size family of one adult plus one infant.

Snapshot of Jobs in Greatest Demand

Figure II-3 on page 27 summarizes the high demand jobs in Connecticut by major occupation group. The healthcare field shows the greatest demand, fueled by the need for nurses. Some of the other occupations such as those in the computer, math, and science field have had recent name changes and are not readily associated with a single major or degree, as is the case with nursing professions.

Figure II-4 on page 28 shows some of the high demand occupations in Connecticut organized by postsecondary education requirement. For example, there are projected to be many annual openings during 2006-2016 for those with postsecondary vocational training as licensed practical/vocational nurses or automotive service technicians/mechanics.

Beyond projecting the number of annual openings, job vacancy surveys are another way to assess employer demand for various occupations, as shown on page 29.

Figure II-3. High Demand Occupations in CT Within the Major Occupational Groups

Healthcare (2,445)
RN • LP/ Vocational Nurses • Radiologic Tech • Dental Hygienists • Pharmacists

Computer/Math/Science (1,779)
Systems Analysts • Software Engineers/Applications • Computer Support Specialists
Network Systems/Data Communications Analysts • Network/Computer Systems Administrators

Business/Financial (1,763)
Accountants/Auditors • Mgmt Analysts • Bus. Operations Specialists • Financial Analysts

Management (1,293)
General and Operations Managers • Financial Managers • Sales Managers
Computer/Information Systems Managers • Social/Community Service Managers

Community/Social Services (648)
Rehabilitation Counselors • Child/Family/School Social Workers • Mental Health/Subs. Ab. Social Workers
Educational/Vocational/School Counselors • Mental Health Counselors

Source: U.S. Bureau of Labor Statistics

Figure I-4. Examples of High Demand Occupations Organized by Education Requirement

H.S. Plus Postsecondary Vocational Training
Licensed Practical and Vocational Nurses (324)[a]
Preschool Teachers, except Special Education (209)
Fitness Trainers and Aerobics Instructors (140)
Mechanical Drafters (70)
Real Estate Sales Agents (69)

Associate's Degree
Registered Nurse (1,114)
Computer Support Specialists (307)
Paralegals/Legal Assistants (129)
Dental Hygienists (123)
Radiologic Tech. (84)

Bachelor's Degree
Accountants and Auditors (683)
General and Operations Mangers (479)
Computer Systems Analysts (450)
Computer Software Engineers, Applications (356)
Management Analysts (300)

Post-Bachelor's Degree
Lawyers (271)
Rehabilitation Counselors (172)
Mental Health and Substance Abuse Social Workers (120)
Pharmacists (100)
Educational, Vocational, and School Counselors (98)

[a] Numbers in parentheses are CT DOL projections of annual number of openings

Where Do Employers Have the Most Job Vacancies?

In spring 2005, the Connecticut DOL published the results of its first — and to date only — job vacancy survey, conducted in fall 2004. The survey asked 3,325 employers across all industries in Connecticut to identify where they currently had job vacancies. With a 42 percent response rate (1,398 employers), these survey data provide additional information on the level of difficulty in filling certain jobs.

Table II-4 shows several occupations (in bold) with job vacancies that are even greater than the projected annual openings, indicating greater difficulty in supply keeping up with demand. On the other hand, many of the occupations with vacancies had only a small percentage of jobs open. The only occupations with more than a 10 percent vacancy rate were: real estate sales agents; dental hygienists; and child, family, and school social workers.

Table II-4. Largest Job Vacancies Compared with Number of Openings Projected in Fall 2004

Occupation	Job Vacancies Fall 2004[a]	Annual Openings Projected 2004[b]	Estimated Number Employed in 2004[c]	Estimated Percent Vacant
Registered Nurses	**1,677**	**1,081**	**31,890**	**5%**
Accountants and Auditors	**809**	**672**	**20,520**	**4%**
Child, Family, & School Social Workers	**598**	**141**	**5,000**	**12%**
Dental Hygienists	**387**	**100**	**3,120**	**12%**
Real Estate Sales Agents	**383**	**82**	**2,560**	**15%**
Paralegals and Legal Assistants	**207**	**104**	**4,620**	**4%**
Civil Engineers	**195**	**79**	**3,250**	**6%**
Licensed Practical and Licensed Vocational Nurses	**305**	**294**	**7,880**	**4%**
Physical Therapists	**114**	**111**	**3,120**	**4%**
Automotive Service Technicians & Mechanics	237	431	10,470	2%
Management Analysts	118	273	10,930	1%
Lawyers	75	193	10,780	<1%

Sources: [a]*Connecticut Department of Labor-Job Vacancy Survey*, Spring 2005
[b]CT DOL Office of Research Labor Market Information (projections for 2004-2014). www.ctdol.state.ct.us/lmi/misc/mostopen.htm
[c]*Connecticut's Industries and Occupations, Forecast 2014* (www.ctdol.state.ct.us/lmi/misc/forecast2014.pdf)

SDE and teacher vacancies. Another state agency that assesses job vacancies and difficulty in filling openings is the Connecticut SDE. On an annual basis, SDE monitors recruitment efforts for the various types of teachers and administrators in the public primary and secondary schools in Connecticut. Also annually, teaching jobs that are the most difficult to fill are identified by SDE as "shortage areas" and incentives such as a teachers' mortgage assistance

program are provided to encourage people to go into those fields. Specifically, the commissioner of Education is required by statute (C.G.S. Sec. 10-8b) to determine subject and geographic shortage areas in which a teacher shortage exists annually, by December 1. The commissioner is directed to consider the following in determining teacher shortages: 1) the number of teacher vacancies in a particular subject or geographic area; 2) the number of new certificates in such subject areas issued by the Department of Education during the preceding year; and 3) the number and types of classes being taught by persons whose training is not specific to the field in which they are teaching. The Alternative Route to Certification program, available only for prospective teachers in shortage areas, provides another pool of applicants for these hard-to-fill positions. Table II-5 shows a number of the same subject certification areas identified as having shortages for each of the past six years.

Table II-5. Annual Teacher Shortage Areas

Subject Certification Area[a]	Shortage-Area Year					
	04-05	05-06	06-07	07-08	08-09	09-10
Bilingual Education, Pre-K-12	✓	✓	✓	✓	✓	✓
Comprehensive Special Education, 1-12	✓	✓	✓	✓	✓	✓
English, 7-12	✓	✓	✓	✓	✓	✓
Mathematics, 7-12	✓	✓	✓	✓	✓	✓
Science, 7-12	✓	✓	✓	✓	✓	✓
Speech and Language Pathology	✓	✓	✓	✓	✓	✓
World Languages, 7-12	✓	✓	✓	✓	✓	✓
Intermediate Administrator		✓	✓	✓	✓	✓
Music, PK-12	✓		✓	✓		✓
Library Media Specialist				✓	✓	✓
Technology Education, PK-12	✓			✓	✓	
Remedial Reading, PK-12		✓	✓			
Teaching English to Speakers of Other Languages (TESOL), PK-12		✓				

[a]Although not included in this table, geographic shortage areas are also identified by SDE.
Source: Annual Teacher Shortage Letter to Superintendents of Schools from Commissioner of Education (for Years 2004-2005 through 2009-2010)

Hiring statistics on the 2008-2009 shortage areas are shown in Table II-6. For each of the 265 open world languages positions, for example, there was an average of seven applicants per position. When rated on a five-point scale, however (with 1=few or no minimally qualified applicants and 5=many highly qualified applicants), school districts assessed the quality of applicant pools as only a “1” or “2” half the time, and no qualified candidates were found for 25 of the positions.

Table II-6. Primary and Secondary Education Shortage Areas Identified by the State Department of Education for School Year 2008-2009				
Certification Area (shortage rank)	**Total Positions to Fill**	**Median # of Applications Per Opening**	**Median Applicant Quality Rating**	**# of Vacancies (No qualified candidates)**
World Languages, 7-12 (1)	265	7	2	25
Speech and Language Pathologist (2)	131	4	1	23
Special Education, 1-12 (3)	566	20	2	34
Mathematics, 7-12 (4)	314	18	2	16
School Library Media Specialist (5)	68	8	2	10
Bilingual Education, PK-12 (6)	34	9	1	6
Intermediate Administrator (7)	253	20	4	12
Science, 7-12 (8)	322	11	2	7
English, 7-12 (9)	364	30	3	10
Music, PK-12 (10)	160	14	3	10
Technology Education, PK-12 (17)	35	6	1	2
Source: Connecticut State Department of Education Division of Assessment and Accountability March 2009 Data Bulletin				

Nurses and allied health professionals and vacancies. The Connecticut Hospital Association, representing more than 140 hospitals and health-related organizations in the state, published 2007 vacancy rates for nurses and allied health professions in 29 acute care hospitals. Table II-7 shows the higher vacancy rate in hospitals for registered nurses in comparison to licensed practical nurses. The broader 2004 Connecticut DOL job vacancy survey found a four percent vacancy rate overall for licensed practical nurses, which may indicate the shortage is more likely in non-hospital settings, or that the demand for employees in this occupation has declined between 2004 to 2007.

Table II-7. 2007 Vacancy Rates for Hospital-Based Nurses and Allied Health Professions	
Profession	**Vacancy Rate**
Physical Therapist	9.5%
Pharmacist	7.3%
Occupational Therapist	6.9%
Staff Registered Nurse (RN)	6.6%
Surgical Procedures/Operating Room Technician	5.9%
Pharmacy Technician	3.5%
Radiation Therapy Technologist	2.8%
LPN	1.1%
Source: Connecticut Hospital Association 2007 Vacancy Rates for Nurses and Allied Health Professionals in Connecticut Acute Care Hospitals	

Where do Employers Have the Fewest Job Vacancies?

The Connecticut DOL job vacancy survey also provided information about occupations with the lowest number of openings, where employer needs were being met by the current workforce. Limiting this examination to occupations requiring postsecondary education, Table II-8 shows areas where there may be an oversupply of workers. There were just three vacancies for nutrition and dietetics, for example, and five vacancies for actuaries. The relatively small number of physical therapy assistants needed (23), however, represents a four percent vacancy rate given the 650 estimated to be employed in the field in 2004.

Table II-8. Fewest Job Vacancies compared with Projected Number of Job Openings

Occupation	Job Vacancies Fall 2004[a]	Annual Openings Projected 2004[b]	Estimated Number Employed in 2004[c]	Estimated Percent Vacant
Nutrition and Dietetics	3	20	570	<1%
Actuaries	5	48	960	<1%
Radiation Therapists	11	36	760	1%
Mechanical Engineers	14	172	6,200	<1%
Surgical Technologists	19	17	1,040	2%
Physical Therapy Assistants	23	30	650	4%
Industrial Engineers	25	108	3,420	<1%
Electrical Engineers	37	60	2,180	2%
Pharmacists	38	97	2,750	1%
Pharmacy Technicians	39	81	2,880	1%
Librarians	28	93	2,350	1%

Sources: [a]*Connecticut Department of Labor-Job Vacancy Survey*, Spring 2005
[b]CT DOL Office of Research Labor Market Information (projections for 2004-2014). www.ctdol.state.ct.us/lmi/misc/mostopen.htm
[c]*Connecticut's Industries and Occupations, Forecast 2014* (www.ctdol.state.ct.us/lmi/misc/forecast2014.pdf)

The next chapter compares the employer demand data described in this chapter to the current and new workforce supply information described in Chapter I, to determine whether there currently is an alignment between postsecondary education and employment.

Chapter III

Are Supply and Demand Aligned?

This chapter compares information on the balance or alignment between the supply of skilled workers and employer demand, focusing on occupations requiring specific postsecondary education. In general, there are many college graduates with broad majors that may lead to employment in a multitude of occupations, and while not discussed in this chapter, these people are expected to fare better financially than those without postsecondary degrees or certificates. Elsewhere, this PRI report has described both the connection between level of education and salaries sufficient to meet basic needs, and the overall need for Connecticut to have an educated workforce to succeed in the 21st century.

In order to assess the alignment of postsecondary education and employment, one needs to examine workforce demand for particular jobs and the number of graduates to fill that need. Although workforce information is often presented in terms of industries or sectors, there are many different types of jobs within a single sector. Rather than examine alignment with industries, the methodology used for this study focuses on distinct occupations and the number of graduates with the required skills and knowledge for each of those occupations, regardless of industry or sector.

The chapter begins with a review of the caveats to consider when examining the supply and demand information. Tables III-1 through III-3 then examine whether there will be projected shortfalls for selected occupations. The chapter concludes with an assessment of the degree of current alignment between postsecondary education and employment.

Caveats Regarding Data on the Match-Up Between Education/Training and Employer Needs

The relationship between educational programs and occupations is not always straightforward. Assessing the degree to which postsecondary education and employment are aligned is challenging given that:

- there may be more than one educational path to a single occupation;
- a single program may lead to a variety of different occupations;
- there are many bachelor's degree programs that are not directly related to a specific occupation; and
- one degree may be used to qualify for another, more advanced degree, such as an undergraduate bachelor's degree with a major in political science leading to a law degree, or a biology major going on to medical school.

Additionally, when analyzing occupational supply data, several factors affect the assumptions that can be drawn from this information, as noted by the Connecticut DOL Training and Education Planning System website:

- many students earning advanced degrees are already employed in that field;
- students from other states may return to their home states, especially at the graduate level. Similarly, foreign students often go back to their home country;
- some programs are not offered in Connecticut, such as veterinary medicine. Connecticut students desiring to major in these programs will have to go out of state and will not be counted in Connecticut supply data;
- those who already have a bachelor's degree may take programs at the certificate level in order to learn new or advanced skills;
- those with undergraduate degrees in various sciences may go on to medical or dental school rather than continue in biology, chemistry, or other sciences; and
- for some occupations, a graduate degree is generally needed for employment. However, students receiving degrees at lower levels, such as a bachelor's degree, may go into other occupations instead of continuing their education in their current field.

Also, the supply of postsecondary graduates and employer demand is not a closed system, limited to Connecticut employers and graduates of Connecticut colleges. For example, there are graduates who went to college in one state, but returned to their state of origin to then become employed. Similarly, there are Connecticut residents who have attended out-of-state schools, graduated, and then returned to Connecticut. There are also national and international companies that transfer workers from one state to another, regardless of where they attended college.

Additionally, there are occupations, such as pharmacy technicians, where training may be received directly from the employer (e.g., a major drug store chain). Other considerations such as a required licensing or exam to practice the occupation may mean that not all graduates are available to practice the occupation.

Finally, as is seen in the migration statistics in Chapter VI, Connecticut also attracts students and workers internationally who may become a resource for meeting employer needs.

How Does Number of Graduates Match Up with Projected Openings?

The Program Review Committee considered an alignment to exist if there was *no more than a 10 percent difference* between the supply and demand figures. Tables III-1 through III-3 provide supply and demand information for occupations that are often associated with a specific postsecondary education major or that require a distinct license or certificate. (Information on the number of 2008 graduates from specific Connecticut postsecondary institutions for each occupation is found in Appendix B). As mentioned earlier, supply and demand information on occupations that are associated with more than one major, such as computer-related occupations and general managerial occupations, are excluded from the analyses, as are majors such as history and psychology that are not directly tied to a single occupation.

The jobs shown in Tables III-1 through III-3 are organized according to U.S. Bureau of Labor Statistics major occupational groups. Table III-1 contains "Healthcare Practitioners and

Technical Occupations" that require postsecondary education and have a clear relationship with the degree or certificate required to perform the occupation.

Assessment of alignment between postsecondary education and healthcare occupations. Although registered nurses are often considered an occupation with a workforce shortage, there currently appears to be a match between the number of graduates and projected need in this field (Table III-1). One independent college, for example, recently noted that 2009 was the first year in recent memory where placement of graduates was approximately 65 percent rather than the usual 100 percent placement rate.

Table III-1. 2008 Supply and Demand for Healthcare Practitioners and Technical Occupations

Occupation	Projected Need for 2008 (Demand)[a]	Total Number Graduated in 2008 (Supply)[b]	Shortfall	Number Graduated Public vs. Independent	
Emergency Medical Technicians and Paramedics	67	29	-38	24	5
Registered Nurses	1,114	1,109	-5	636	473
Licensed Practical and Licensed Vocational Nurses	324	658	+334	No info	No info
Surgical Technologists	50	12	-38	12	0
Radiation Therapists	38	120	+82	56	64
Occupational Therapy Assistants	12	32	+20	24	8
Occupational Therapists	47	47	0	0	47
Physical Therapists	98	47	-51	28	19
Physical Therapy Assistants	24	17	-7	17	0
Nutritionists and Dietitians	16	37	+21	18	19
Dental Hygienists	123	143	+20	32	111
Social Workers[1]	386	373	-13	335	38
Substance Abuse and Behavioral Disorder Counselors	67	61	-6	61	0
Pharmacists	100	103	+3	103	0
Pharmacy Technicians	171	0	-171	0	0
Veterinarians	54	0	-54	0	0
Veterinary Technologists and Technicians	75	11	-64	11	0

[1]Combines four subtypes of social workers.
Note: PRI considered an alignment to exist if there was no more than a 10 percent difference between the supply and demand figures.
Source: [a]CT DOL Office of Research Labor Market Information
www.ctdol.state.ct.us/lmi/misc/mostopen.htm
[b]State of Connecticut Department of Higher Education Degree Completions
www.ctdhe.org/database/CompletionsPG81.htm#Degree%20level

Alignment: Balanced. If it is assumed that all graduates remain in Connecticut, the number of social work graduates and demand in that occupation appear to be evenly balanced.

There also seems to be alignment between demand and postsecondary education production of occupational therapists by independent institutions, notably Quinnipiac and Sacred Heart Universities. The number of pharmacy graduates and demand also appear in balance; however, because of its national student draw, one would not expect all the University of Connecticut pharmacy graduates to remain in Connecticut. This theory is supported, in part, by information obtained by the Connecticut Hospital Administration, showing a 7.3 percent vacancy rate for pharmacists at acute care hospitals.

Misalignment: Undersupply. There are several healthcare occupations that appear misaligned with the number of graduates produced in 2008. There seems to be an *undersupply* of emergency medical technicians and paramedics as well as surgical technologists. There also appears to be a shortage of graduates in physical therapy, physical therapy assistants, veterinary technologists/technicians, and to a lesser extent, substance abuse and behavioral disorder counselors. (Note that all veterinarians in Connecticut have been trained outside of Connecticut as the only veterinary school in New England is at Tufts University in neighboring Massachusetts.)

Misalignment: Oversupply. There are several healthcare occupations that seem to have an *oversupply* of graduates in relation to the occupation's demand. Although identified as an occupation in high demand, the current production of licensed practical and licensed vocational nurses has more than twice the number needed according to the Connecticut DOL projections. Radiation therapists, occupational therapy assistants, nutritionists and dietitians, and dental hygienists, also seem to be in oversupply in relation to the projected number of openings in these fields.

Caveats. Because there are challenges in projecting the number of openings in particular fields, the demand statistics may be tempered by vacancy rate information gathered since the projections were made. Taking into consideration the vacancy rate information, there may be more openings for registered nurses, social workers, and dental hygienists than originally projected and, if so, then there continue to be shortages in these fields despite the seemingly adequate number of graduates.

Assessment of alignment between postsecondary education and education, training and library occupations. Every October, SDE surveys all the local school districts to determine teacher and administrator shortage areas. Table III-2 shows the number of positions to be filled for the 2008-2009 school year and the number of recent graduates certified to teach in particular areas. Besides Connecticut graduates, the available workforce supply expands to include persons who obtained Connecticut certificates through methods outside of the state's postsecondary institutions including: Alternative Route to Certification (ARC); Teach for America (TFA); and those who attended out-of-state colleges and have new Connecticut certification.

Misalignment: Undersupply. As described in Chapter II, SDE annually identifies subject (and geographic) "shortage areas" for teaching jobs that are the most difficult to fill, and an asterisk is used to identify the 2008 subject shortage areas. In addition to the shortage areas, there also appears to be an undersupply of business teachers. The number of art teachers produced by Connecticut colleges is fairly close to the number of open positions; however, there are many

Table III-2. 2008 SDE Projected Supply and Demand for Education, Training and Library Occupations					
Occupation	**Total Positions to Fill for 2008-09 School Year (Demand)[a]**	**Total Number Graduated in 2008 (Supply)[b, 1]**	**Shortfall (including ARC, TFA, etc.)**	**Number Graduated**	
				Public	**vs. Indpndt**
Comprehensive Special Education, K-12*	566	200 (340)	-226	129	71
World Languages, 7-12*	265	46 (127)	-138	33	13
Mathematics, 7-12*	314	123 (224)	-90	71	52
Science, 7-12*	322	121 (259)	-63	61	60
Secondary School Teachers, Except Special and Voc. Ed.	1,260	742 (1,208)	-52	376	366
Speech and Language Pathology*	131	47 (80)	-51	47	0
English, 7-12*	364	218 (333)	-31	106	112
Bilingual Education, PK-12*	34	0 (3)	-31	0	0
Business, 7-12	43	20 (29)	-14	2	18
Music, PK-12*	160	88 (154)	-6	52	36
Technology Education, PK-12*	35	19 (29)	-6	19	0
Physical Education	149	117 (182)	+33	117	0
School Counselor	144	125 (182)	+38	76	49
Art Education	87	92 (159)	+72	90	2
Intermediate Administrator*	253	554 (589)	+336	305	249
History & Social Studies, 7-12	217	260 (363)	+146	136	124
Elementary School Teachers, Except Special Education	913	1,358 (1,927)	+1,014	536	822
Library Media Specialist*	68	13 (20)	-48	11	2
Librarians	66	119	+53	119	0

[1]Numbers in parentheses also add in: certificates issued via the Alternative Route to Certification; participants in Teach for America; and those who attended non-Connecticut colleges.
*Signifies 2008-09 school year teacher shortage area as identified by SDE.
Note: PRI considered an alignment to exist if there was no more than a 10 percent difference between the supply and demand figures.
Source: [a]CT State Department of Education 2008-09 Hiring Statistics, from March 2009 Data Bulletin
[b]Connecticut State Department Education Bureau of Educator Standards and Certification, Data on First Issuance of Temporary 90-Day or Initial Educator Certificates, January 1, 2008 to December 31, 2008.

more individuals obtaining Connecticut certification as art teachers who received their education outside of Connecticut.

Misalignment: Oversupply. The surplus of elementary education teachers is especially apparent when the 477 newly certified elementary education teachers who attended out-of-state colleges (plus 92 certified under the Teach for America program) are added to those who attended Connecticut colleges (1,358). More Connecticut certified elementary school teachers received their education from independent colleges in Connecticut (822) than from public state colleges (536) or out-of-state colleges (569). (Appendix B shows a sizable number of the

certified elementary school teachers graduated from either Sacred Heart University or the University of Bridgeport.)

There also appears to be an oversupply of history and social studies teachers, as well as librarians. Almost twice the number of librarians (in school and non-school settings) graduated (all from Southern Connecticut State University) than there are openings.

Assessment of alignment between postsecondary education and architecture, engineering, and other occupations. Table III-3 shows engineering and architecture occupations as well as some additional occupations that fall into other various categories. Engineering is often cited as vital to competing in the global economy. None of the architecture and engineering occupations appear to be in alignment. There seems to be an *oversupply* of architects, mechanical engineers, and mechanical engineering technicians, but an *undersupply* of industrial engineers and civil engineers.

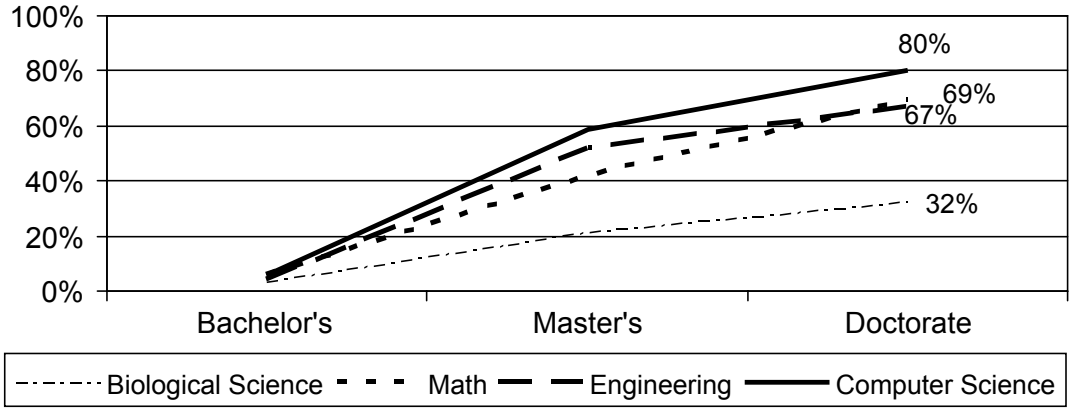
Table III-3. 2008 CT DOL Projected Supply and Demand for Architecture, Engineering and Other Occupations

Occupation	Projected Need for 2008 (Demand)[a]	Total Number Graduated in 2008 (Supply)[b]	Shortfall	Number Graduated Public vs. Independent	
Civil Engineers	120	81	-39	56	25
Industrial Engineers	139	36	-103	12	24
Mechanical Engineers	138	290	+152	109	181
Mechanical Engineering Technicians	26	44	+18	31	13
Architects	54	102	+48	0	102
Other Occupations					
Airline Pilots, Copilots, and Flight Engineers	16	0	-16	0	0
Accountants and Auditors	683	732	+49	500	232
Actuaries	42	44	+2	44	0
Forensic Science	3	111	+108	0	111
Lawyers	271	513	+242	188	325
Paralegal and Legal Assistants	129	96	-33	60	36
Real Estate Sales Agents	69	1,148	+1,079	mostly	
Automotive Service Technicians/Mechanics	290	415	+125	No info	No info

Note: PRI considered an alignment to exist if there was no more than a 10 percent difference between the supply and demand figures.
Source: [a]CT DOL Office of Research Labor Market Information. www.ctdol.state.ct.us/lmi/misc/mostopen.htm
[b]State of Connecticut Department of Higher Education Degree Completions www.ctdhe.org/database/CompletionsPG81.htm#Degree%20level

International students. However, another factor in the alignment of postsecondary education and the science, technology, engineering and math (or STEM) fields in particular, is the residency status of students. Figure III-1 shows that, as the degree level increases, there is an increasing proportion of international students, who may or may not remain in Connecticut following completion of their degrees. A report recently estimated that 50 percent of international students receiving their bachelor's degrees from New England colleges remained in New England following graduation, a proportion more than twice that of New England college graduates from other parts of the U.S. (at 21 percent).[13]

Figure III-1. Percent of Students from Countries Other Than U.S. in STEM Fields



Source: DHE 2007-08 Report of Degrees Conferred by CT Institutions of Higher Education

The growth in the proportion of international students, however, is reportedly slowing from a 10 percent annual increase in 2007 to only a three percent annual increase in 2008.[14] In analyzing first-time graduate-school enrollments by field, the report noted a sizeable increase of 11 percent in the number of U.S. students entering graduate programs in engineering.

Additional information about engineering supply and demand. In 2008, after hearing from companies that they were having difficulty finding engineering talent in Connecticut, and from in-state universities that their engineering graduates were unable to find jobs in Connecticut, the Office of Workforce Competitiveness (OWC) surveyed employers and graduating engineering students. With a caution that the response rate was very low — only six percent of surveyed companies responded — OWC found:

- six in 10 engineering students seeking employment did not have a job offer in the May before their graduation;

[13] Sasser, Alicia. *The Future of the Skilled Labor Force in New England: The Supply of Recent College Graduates*. Federal Reserve Bank of Boston New England Public Policy Center Research Report 08-1, September 2008.
[14] Schmidt, Peter. *Growth in International Enrollments Slows at U.S. Graduate Schools*. September 16, 2009 Chronicle of Higher Education.

- surveyed companies reported an 8.2 percent vacancy rate for engineers and a 7.1 percent vacancy rate for engineering technicians;
- surveyed companies said vacant engineering positions could only be filled by experienced engineers; however, many of the engineering technician vacancies could be filled with inexperienced applicants; and
- two-thirds of students who reported having accepted a job offer had prior experience with the firm while a student.

To help Connecticut companies find engineers, and engineering graduates find employment, the Connecticut Office of Small Business Innovation Research (SBIR) has launched a program called, "Careers for Engineers," that is an electronic service with the intent of matching engineering job seekers with available jobs.

Other occupations. Of the remaining other occupations shown in Table III-3, actuaries, and accountants and auditors, appear to have a balanced number of graduates to fill the projected needs. An *undersupply* of graduates seems to occur in the occupations of pilots and paralegals/legal assistants, and an *oversupply* in the real estate sales agent, lawyer, and forensic science occupations. Further, the job vacancy survey conducted by Connecticut DOL found a vacancy rate higher than the number of openings projected in 2004 for real estate sales agents; thus, it is unclear whether supply has caught up with demand, or there is difficulty capturing data regarding the real estate sales agent occupation.

It is also unknown how many in the legal and forensic science occupations, for example, obtain jobs outside of Connecticut. Additionally, a recent article suggested that although some in higher education may be aware of the oversupply of lawyers, law schools may continue to be established because they add to a college's prestige without adding significant expense — and may even provide additional income for the university.[15] On the other hand, the article further points out possible future employment opportunities for graduates to apply their legal skills outside of traditional law firm jobs, for example, in business or philanthropy.

Overall Assessment of Alignment Between Postsecondary Education and Employment

Based strictly on the supply and demand figures obtained from the Connecticut Departments of Labor, Education, and Higher Education (and assuming graduates remain in Connecticut and immediately enter the workforce), the following occupations appear to be particularly well aligned: registered nurses, occupational therapists, social workers, pharmacists, and actuaries. When hospital vacancy rate data are added to the equation, however, it appears that as recently as 2007 (see Table II-7), hospitals experienced a shortage in registered nurses, occupational therapists, and pharmacists. The shortage of nurses was also found several years ago in 2004 in the Connecticut DOL job vacancy survey; however, the situation could have changed in the ensuing years.

[15] Mangan, K. *Law Schools Mull Whether They Are Churning Out Too Many Lawyers*. Chronicle of Higher Education, July 9, 2009.

There are additional occupations that appear to be fairly well aligned (e.g., substance abuse and behavioral disorder counselors, and accountants and auditors), although the Connecticut DOL job vacancy survey reported more job vacancies for accountants and auditors than annual projected openings. The understanding of the demand for accountants and auditors is further complicated by information on the accuracy of projections as assessed in Chapter VI, which suggest a 10 percent overestimate in the number of accountants and auditors needed in Connecticut.

There are other occupations, however, that stand out as having an *oversupply* or overproduction of graduates. These include: licensed practical and licensed vocational nurses, radiation therapists, elementary school teachers, mechanical engineers, architects, forensic science, real estate agents, and lawyers. (As will be seen in Chapter VI, projections for the number of lawyers needed in Connecticut were 44 percent higher than actually occurred.) Just as Connecticut's veterinarians have all been educated in other states, *Connecticut* may be training forensic scientists to meet employment demands in other states; however, there are clearly more graduates in this field than are needed to meet Connecticut employer demand.

Occupations that show an *undersupply* or underproduction to meet the demand are: emergency medical technicians and paramedics, surgical technologists, veterinary technologists and technicians, special education teachers, world language teachers, and industrial engineers. No postsecondary education institutions in Connecticut offer degrees in veterinary medicine and thus, all veterinarians employed in Connecticut were trained elsewhere. For-credit pharmacy technician programs are not currently offered at Connecticut colleges, and training may be occurring either in noncredit certificate programs (the overarching community college or higher education systems do not collect statistics on the number of students completing noncredit certificate programs) or by employers such as CVS and RiteAid pharmacies.

Conclusions. Given the numerous cautions detailed earlier in interpreting this data, Table III-4 summarizes this alignment analysis. The undersupply of EMTs and surgical technologists and the oversupply of LPNs and radiation therapists, show a misalignment among some health care occupations. Other health care fields, however, such as registered nurses and occupational therapists, may have a fairly good match between supply and demand. These mixed results illustrate several points about the alignment of postsecondary education and employment:

- alignment needs to be assessed by occupation;
- for some occupations (e.g., actuaries and pharmacists), employer demand for an adequate supply of graduates appears to be met by Connecticut postsecondary institutions;
- some occupations, such as teachers, are able to closely monitor shortage areas and number of graduates produced based on their certification requirements;
- awareness of occupational shortages *may* lead to production of more postsecondary education programs and graduates in a given area (e.g., nursing (RNs));

- awareness of occupational shortages *may not* lead to production of more postsecondary education programs and graduates if students do not choose to enter a field (e.g., world language teachers);
- all Connecticut employer needs do not have to be met by graduates from state postsecondary education institutions (e.g., veterinarians); and
- regardless of occupation, increasing the percent of students who complete their degrees and certificates — especially at the community college level — will better meet overall employer demand for a skilled and knowledgeable workforce.

Table III-4. 2008 Alignment Status of Selected Occupations

Undersupply	Aligned	Oversupply
EMTs	Registered Nurses?	LPNs
Surgical Technologists	Pharmacists?	Radiation Therapists
Physical Therapists	Occupational Therapists?	Occupational Therapy Assistants
Physical Therapy Assistants	Social Workers	Nutritionists and Dietitians
Veterinarian Technologists and Technicians	Actuaries	Real Estate Sales Agents?
Library Media Specialists	Accountants and Auditors?	Librarians
Industrial Engineers		Mechanical Engineers
High School Math Teachers		Mechanical Engineering Technicians
Special Education Teachers		Architects
High School Science Teachers		Lawyers
Bilingual Education Teachers		Forensic Science
World Language Teachers		Elementary School Teachers
		History & Social Studies Teachers

Source: PRI analysis

Chapter IV

Connecticut's Higher Education System

Connecticut has a well-developed higher education system. There are 18 public degree-granting institutions and 29 independent colleges and universities (see Appendix C for a list of schools). In addition, the U.S. Coast Guard Academy, located in New London, operates under federal authority. In fall 2008, there was a total of 184,544 students enrolled in Connecticut's public and independent colleges and universities, of which 73 percent were Connecticut residents. Of the total students, 64 percent were enrolled at public institutions.[16] During the 2007-2008 school year, there were 36,634 degrees conferred by Connecticut colleges and universities, of which 51.2 percent were awarded from public institutions.[17]

Because of the critical role colleges play in a state's economic development, this study examined how well academic institutions align themselves, particularly public colleges, with the employment needs of state businesses. Colleges and the students they graduate are vital to economic development for many reasons. One key role is providing employers with a supply of graduates that who are able to respond to a changing work environment and educated in new and emerging fields.

One of the ways states have promoted alignment is to encourage state agencies involved in workforce development issues, education, and higher education, and private organizations, to meet and discuss how to coordinate state-led efforts so that educators can develop programs, in part, based on employer need. In Connecticut, multiple state agencies are required by law to chair and participate in various boards and committees in order to promote alignment across education, higher education, and workforce development, as discussed in the next chapter.

The PRI committee also found numerous statutory references aimed at requiring the BGHE, DHE, and individual public higher education institutions to consider ways to promote the economic development of the state, as part of their overall responsibilities. State law has supported postsecondary and workforce alignment efforts by creating statutory incentives for student loan incentive and post-graduate loan forgiveness programs. Although many of these types of programs either exist in statute or rely on federal grants for funding, they are usually considered pilot programs and continued funding of them has not always occurred.

This chapter focuses on the role of the Board of Governors for Higher Education, its administrative arm, the Department of Higher Education, and each of the constituent units as they relate specifically to the linkages mandated by Connecticut law. Chapters VII and VIII provide detailed information in two areas to "drill down" on whether certain state policies and programs, such as loan incentive and forgiveness programs, have increased graduates in workforce shortage areas.

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[16] Department of Higher Education, *Report: Fall 2008 College and University Enrollment in Connecticut – Comprehensive Report, June 2009*, p. 1.
[17] Ibid, pgs. 1&9.

Connecticut's Public Higher Education System

Figure IV-I outlines the basic organizational structure of Connecticut's public higher education system and Figure IV-2 shows the geographic locations of public colleges and universities in the state. In addition to BGHE and DHE, the public system of higher education is organized into four constituent units, each with its own board of trustees including the:

- Board of Trustees of the University of Connecticut, which is responsible for the university and five branch campuses, the medical school, and the law school;
- Board of Trustees of the Connecticut State University System, which is responsible for the four state universities;
- Board of Trustees of the Connecticut Community College System, which is responsible for 12 two-year colleges; and
- Board for State Academic Awards, which is responsible for Charter Oak State College (the state's external degree-granting institution), and online learning and distance education.

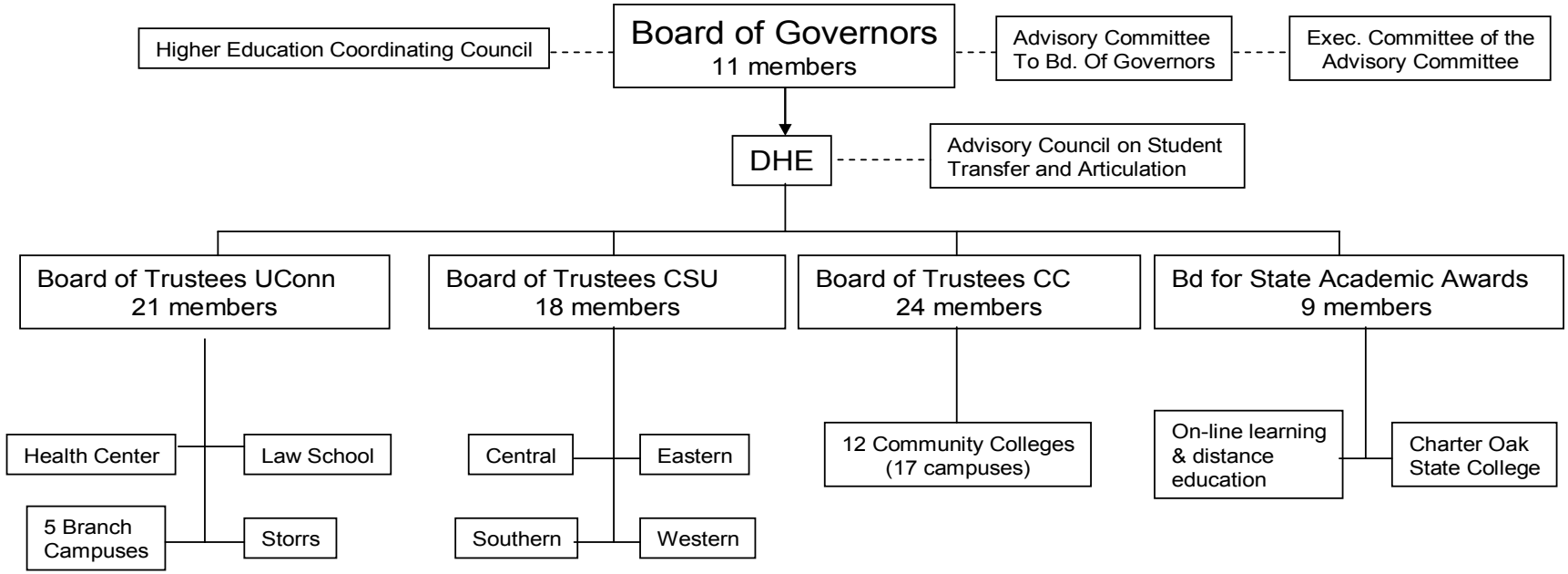
Board of Governors. The Board of Governors for Higher Education was created in 1982 as a successor to the Board of Higher Education. It is the central policy-making authority for public higher education in Connecticut and serves as a coordinating body for all of the public and independent colleges, universities, and post-secondary institutions of Connecticut.

The board comprises 11 members, seven appointed by the governor and the remainder by the leaders of the Connecticut General Assembly. Board members cannot be employed by or be a member of any of the boards of trustees for any public or independent Connecticut higher education institution.

The Department of Higher Education serves as the board's staff, and the board selects and hires the commissioner of higher education. In FY 08, DHE had 48 full-time employees and operating expenses of about $75 million (the entire public higher education system's operating expenses were almost $734 million). The board's responsibilities, laid out in C.G.S. Sec. 10a-6, are to:

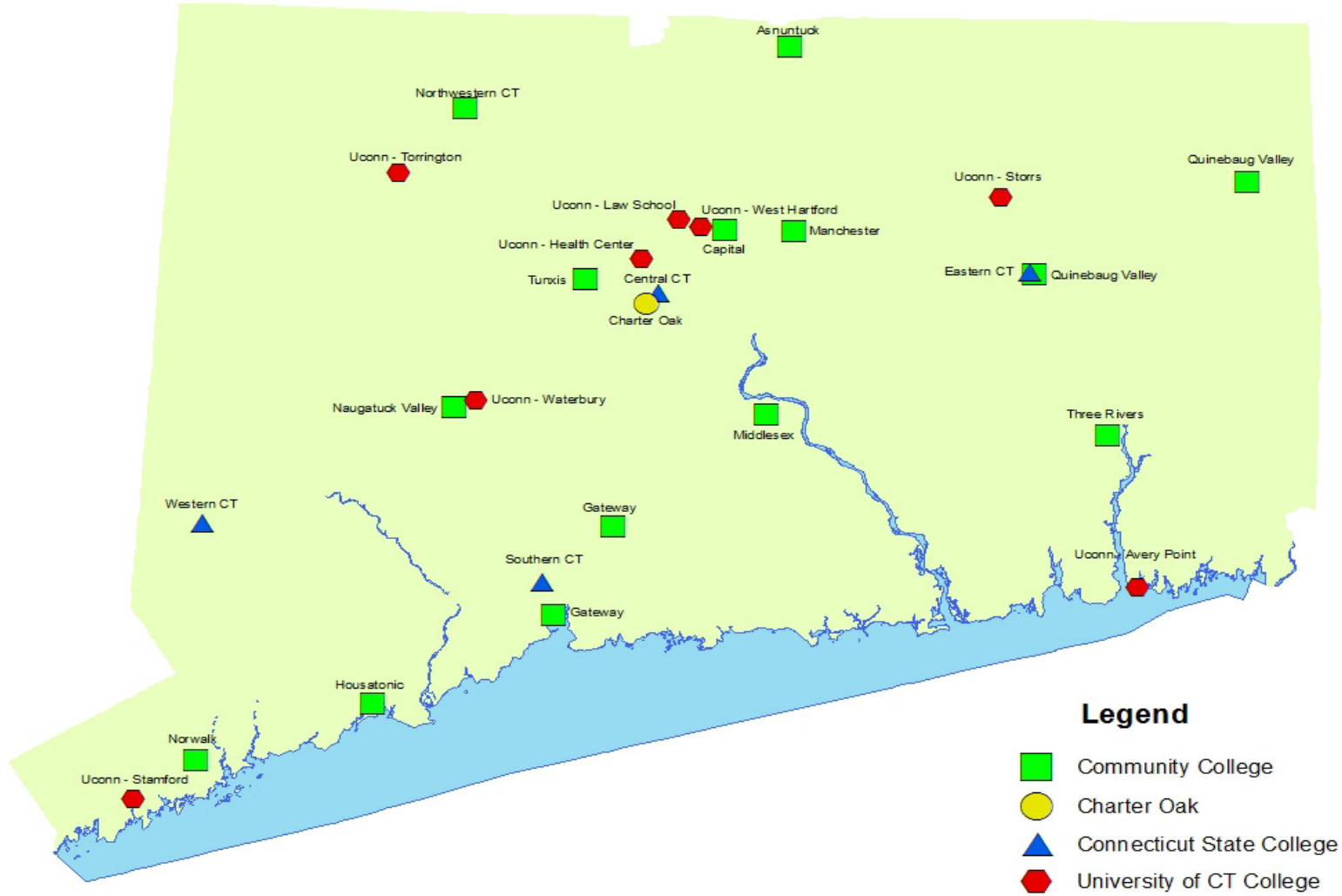
- establish statewide policy for Connecticut's public higher education system;
- develop a higher education master plan;
- establish statewide tuition and financial aid policies;
- evaluate institutional effectiveness;

Figure IV-1. CT's Public Higher Education System Structure



Source: DHE

Figure IV-2. Public Colleges and Universities in Connecticut.



Source: DHE & Legislative ITS

- merge and close institutions;
- review and approve the mission statements of the constituent units and the role and scope statements of the individual public institutions;
- approve recommendations by constituent units to establish new academic programs or eliminate existing programs;
- prepare and present to the governor and the General Assembly a consolidated operating and capital budget for all constituent units of higher education;
- review and make recommendations on plans received from each constituent unit for development and maximum utilization of resources;
- appoint advisory committees to assist in defining and suggesting solutions for the problems and needs of higher education;
- establish an advisory council for higher education with representation from public and independent colleges to study ways to coordinate efforts of all the state's colleges in providing an enriched educational environment for the state's citizens;
- coordinate programs and services throughout higher education, including procedures to evaluate the impact on independent institutions of higher education of proposals affecting public higher education institutions;
- enter into contracts, leases, or other agreements;
- maintain a central higher education information system; and
- undertake studies and activities as will best serve the higher education interests of the state.

The Board of Governors is primarily viewed as a coordinating body for all of Connecticut's higher education system but it has limited authority over both the public and independent colleges and universities in the state. For the public colleges and universities, the system of governance is primarily concentrated at the constituent unit level, with BGHE not proactively setting strong program agendas or mandates for them. One reason for this is that although BGHE presents a single consolidated budget compiled from those submitted by the constituent units, it has only review and comment authority. In addition, legislative appropriations are made directly to the constituent unit's boards of trustees.

Because of the decentralized nature of the public higher education system in Connecticut, the committee was unable to locate a compendium of or identify the extensive array of successful alignment initiatives being achieved at the constituent unit, individual college, and even academic department level through the use of federal, state, and private grant funds, which are used for a wide range of activities. For example, several community colleges receive federal grants that allow them to link to low performing high schools that are "feeder schools" into their local community college. To address the remedial needs of high school students prior to them graduating and ensuring greater success when enrolled, these colleges partner with high school faculty to devise remedial strategies to be taught to students while they are still in high school. Other programs, such as *Achieving the Dream*, are aimed at

providing more intensive supports once a high school graduate enrolls in college and helps the graduate overcome obstacles to graduation.

Standing Advisory Committee. There is a 22-member Standing Advisory Committee to the board, which has representation from independent and public college trustees, administrators, faculty members, and students. The committee is statutorily required to meet at least twice yearly with the board. The role of the advisory committee is to assist the board in performing its statutory duties.

Higher Education Coordinating Council. The Higher Education Coordinating Council, established under P.A. 92-126, is made up of the chairperson of the boards of trustees and the executive officers of each constituent unit, the OPM secretary, and the commissioners of DHE and SDE. Under current state law, the council is responsible for identifying, examining and implementing savings in administrative functions and, since 1999, developing accountability measures for each constituent unit and each public institution of higher education. The Board of Governors was required to approve these measures, which are now used by DHE and each constituent unit to report to the committees of cognizance of the legislature. The report must assess progress towards meeting the statutory goals of:

- enhancing student learning and promoting academic excellence;
- joining with K-12 to improve teaching at all levels;
- ensuring access to and affordability of higher education;
- *promoting the economic development of the state to help business and industry sustain strong economic growth*;
- responding to the needs of society; and
- ensuring the efficient use of resources.

The accountability measures, along with progress made towards achieving them, are described further in an annual publication entitled *Higher Education Counts: Achieving Results*.

Statutory boards/commissions. Table IV-I shows statutorily mandated boards, councils, and commissions within the Connecticut statute governing higher education, and their intended purposes. Department staff indicated, as the table shows, three of the four required entities are either no longer active or have never been active for various reasons. In addition to these, DHE sits on four OWC statutory boards, of which two are active and two are inactive (see Chapter V for the names of these boards). DHE also is co-chair of the P-20 Commission, which was created by executive order, and is a member of the Connecticut Education and Training Commission, described in detail in Chapter V.

Table IV-1. Statutory Boards and Commissions Chaired by BGHE or DHE			
Name and Purpose	**Participants (Lead Agency in Bold)**	**Status**	**Established**
Higher Education Coordinating Council - identify, examine and implement administrative savings and develop accountability measures for each constituent unit and each public institution of higher education	Chairmen of the boards of trustees, chief executive officer of each constituent unit, OPM secretary, and commissioners of DHE and SDE (no lead designated)	Changed to more informal CEO meeting before the inclusion of OPM. Meets at the behest of DHE several times a year when issues arise	1992 (revised to include OPM in 1999)
Task Force to Develop Higher Education Management Information and Student Information System – assist DHE and the constituent units in developing an integrated, commonly-linked higher education management and student information system	CEO of each constituent unit; chief data processing officers of DHE, UConn, CSUS, community college system; and each institution in the CSUS; and the OPM secretary (no lead designated)	Never active - not funded	1992
Blue Ribbon Task Force - develop strategic plan for Higher Education	**BGHE;** DHE; SDE; DECD; DOL; Chairs and presidents of each public college; OWC; and OPM secretary. Also representation from: • public and independent colleges • arts and culture field • science and technology • statewide business organization • nonprofit education foundation • university research and its commercial application • PK – 12 education • One additional person	Never active – funding lapsed in FY 07 and was rescinded in FY 08	2007
Technical Education Coordinating Council - review and evaluate the coordinated delivery of technical and technological education to meet the employment needs of business and industry	**DHE;** DECD; DOL; CEOs of each constituent unit; president of the Connecticut Conference of Independent Colleges; superintendent, teachers, and parents of the Technical Schools; various business members; and chairs and ranks of education and commerce committees	No longer active	1989
Advisory Council on Student Transfer and Articulation - develop a plan that maximizes the transferability of credits	**DHE**; chief academic officer of each constituent unit; teaching faculty, students, and other representatives of public colleges and universities; and representatives from independent colleges	No longer active in this form but through the Standing Advisory Committee to the Board	1991 (revised 1995)
Source: CT General Statute, DHE, staff, and PRI			

As shown in the table, the legislature created a Blue Ribbon Task Force in 2007, primarily charged with developing a master strategic plan for higher education. Chapter V gives more details about its legislative charge and discusses why the task force was never constituted. To date, BGHE does not have a master strategic plan.

Targeted incentive and loan forgiveness programs. The Board of Governors is responsible for the administration of several incentive and loan forgiveness programs that are targeted at getting students to major in specific fields of study that are experiencing critical worker shortages, or have graduates of such programs remain in Connecticut and be employed in the critical shortage field. Table IV-2 shows the name of each program, its statutory reference, and the amount of funding received by each, if any.

Constituent Units

As noted above and shown in Figure IV-1, there are four constituent units under BGHE. Although BGHE is the central coordinating and policy-making power, in practice the public higher education system is decentralized with decisions made at the constituent unit level. Each of the boards of trustees at the constituent unit level are granted similar authority under the law. The boards have fairly broad authority in terms of governing their individual units and are responsible for establishing and administering academic, financial, and administrative policies. Each board has jurisdiction over its respective college or university system and makes policy and budgetary decisions regarding its system. Each board also develops mission statements for the colleges, identifying the role and scope of each college within the system, along with its institution's strengths and specialties, although the statements must be reviewed and approved by BGHE.

Connecticut Community College System. Connecticut's regional two-year public college system was created in 1965 to promote access to higher education opportunities and help meet the state's demand for a skilled workforce. At present, the system includes 12 community colleges governed by an 18-member board of trustee; 16 appointed by the governor and two students who are elected by their peers. At least six members must have expertise and experience in business, labor, or industry, and alumni are represented. The system's administrative staff, headed by a chancellor, oversees day-to-day operations and coordinates activities among the individual colleges.

Types of programs offered. Community colleges provide two types of educational programs: credit and noncredit. The colleges' credit programs lead to associate degrees or certificates and require a high school diploma or its equivalent for admission. It offers career programs (such as nursing, information technology, and early childhood education), as well as general study and transfer programs. Not all programs are offered at all colleges. In FY 08,

Table IV-2. Statutory Loan Incentive or Forgiveness Programs Administered by DHE			
Name of Program or Pilot and Purpose	**Statutory Cite**	**Legislation Adopted**	**Funding**
Connecticut Nursing Incentive Program – provides funding for up to four community colleges that partner with hospitals and secure non-state funding to increase faculty members that are qualified to teach students to become registered nurses	10a-19c	2004	$200,000 appropriated for 2005 and 2006. Additional Education and Health Initiatives funding was used to fund programs at Capital, Norwalk, Naugatuck, and Three Rivers at $75,000 each for both years; $600,000 total expended.
Training for Early Childhood Education Teachers – within available appropriation expand capacity of programs through development of accelerated alternative route program	10a-19d	2006	Funded at $50,000 from Early Childhood appropriation in 2008
"Engineering Connecticut" Loan Reimbursement Grant - within available appropriation, up to $5,000 in student loan reimbursements for candidates who are CT residents, have outstanding student loans in their names, earned an engineering undergraduate or graduate degree in the U.S. and have been hired as a full-time engineer in CT after 12/31/05	10a-19e	2006	$250,000 appropriated in 2007
"You Belong" Loan Reimbursement Grant – within available appropriation, up to $10,000 in student loan reimbursements for candidates who are CT residents, have outstanding student loans in their names, hold a doctorate in any field from any college or university, and are newly employed full-time in the state after 12/31/05 in an economically valuable field as determined by DECD, and the company or institution has been qualified by DECD	10a-19f	2006	$250,000 appropriated in 2007
High Technology Doctoral Fellowship Program – within available appropriation, a fellowship program to attract students to state doctoral programs in high technology and encourage them to teach in a college or university in the state	10a-25n	1987	Last funded at $50,000 in 1994

Table IV-2. Statutory Loan Incentive or Forgiveness Programs Administered by DHE			
Name of Program or Pilot and Purpose	**Statutory Cite**	**Legislation Adopted**	**Funding**
State Scholarship Program for Nursing Education and Program for the Forgiveness of Loans provided by the state for Nursing Education – provided state loans for state residents entering into or advancing in the nursing profession; forgive loans for candidates who worked as nurses in the state for 5 years	10a-162a	1988	Last funded at $75,000 in 1992
Teacher Incentive Loan Program for Training in Areas of Teacher Shortages – provided loans of up to $5,000 per year for 2 years to students entering approved teacher education programs; each year 20% of loan is forgiven for every year the student taught in a CT public school in a field suffering a teacher shortage	10a-163	1977	Not funded since the 1980's
Scholarship Aid for Teachers of Children Requiring Special Education – applicant must agree to teach children requiring special education in Connecticut for at least three years	10a-168	1977	Not Funded
Minority Teacher Incentive – within available appropriation, provides up to $5,000 in grants for individuals who are enrolled in CT teaching training programs and full-time junior and senior minority students, graduate students that received grant for one year at undergraduate level, or enrolled in alternative route to certification and eligible for up to $2,500 a year, for up to 4 years in loan reimbursements in return for students teaching in a CT public elementary or high school. Ten percent of grant recipient awards must be to minority students who transfer from a community college	10a-168a	1998	$481,374 appropriated in FY 08 and FY 09 each
Information Technology Scholarship Pilot Program – within available appropriation, provide grants of up to $3,000 per year and for students enrolling in an information technology related degree or certificate program at any public or independent college or university	10a-169a	2000	One-time funding of $2.5 million in FY 2001

Table IV-2. Statutory Loan Incentive or Forgiveness Programs Administered by DHE			
Name of Program or Pilot and Purpose	**Statutory Cite**	**Legislation Adopted**	**Funding**
Information Technology Loan Reimbursement Pilot Program - within available appropriation, provides up to $2,500 a year, for up to 2 years, in loan reimbursements to individuals who attended a CT college, majored in an information technology related field, and were employed in an information technology position for a CT company on or after Jan. 1, 2001	10a-169b	2000	Not Funded
High Technology Graduate Assistantship Program – within available appropriation, $10,000 annually for students enrolled in graduate programs in CT in high technology fields which meet statewide economic needs and are approved by BGHE and designated, in consultation with DECD; must be employed by institution in a teaching or research capacity for not less than 50 percent of full-time	10a-170a - 10a-170d	1983	Last funded at $193,000 in FY 1989
Academic Scholarship Loan Program (encourage people to teach in state's public schools) – provides loans to academically talented graduating high school students and new college students who became certified and taught in public or approved private schools in the state. Recipients attending public colleges could receive up to $3,000 a year for four years, those attending independent colleges, up to $5,000. Loans were forgiven on a graduated scale depending on the number of years teaching in a CT with 100% forgiven after 5 years of teaching	10a-170e, f	1984	Last funded at $135,000 in FY 1990. Last loan repaid in September 2009
Academic Scholarship Graduate Student Loan Program (graduate teacher program) – scholarships for students accepted or currently enrolled in graduate teacher preparation programs; students must be CT residents and have an undergraduate degree	10a-170r - 10a-170t	1986	Not Funded
Source: DHE staff, PRI, and Connecticut General Statute			

there were 51,105 credit students and 40,372 noncredit students (full-time and part-time). Only for-credit course tuition and expenses are eligible for PELL grant financial support.[18]

Admission to continuing education noncredit courses at community colleges does not require a secondary school credential but there may be other prerequisites for some classes. The noncredit courses offered encompass a variety of instruction, from professional continuing education classes and computer skills training to recreational, cultural, and personal enrichment classes. The community colleges also develop and provide customized workforce development courses for local employers through their Business and Industry Services Network. All noncredit courses can be generally classified as either workforce or personal development.

Regional Advisory Boards. Mandated since 1989, C.G.S. Sec. 10a-73 requires each of the 12 community colleges have a regional advisory board. The president of each college recommends individuals to the board, which must be representative of the geographic area served. Related to the alignment of postsecondary education and employment, the purpose of each council is to advise the board of trustees and the college president about appropriate educational programs to meet the needs of the communities represented by each college.

Program Advisory Councils. Another way the community colleges align with employer needs is through their Program Advisory Councils. Each community college professional program has a Program Advisory Council. Advisory councils are composed of employers and industry leaders who help the college stay aware of the needs of its regional businesses in a particular program area. The councils offer input to program curriculum and are concentrated in the professions, business, and financial areas (Table IV-3).

There are numerous examples of successful programs that align students and graduates of the state's community colleges with skills needed by Connecticut employers. One example is at Asnuntuck Community College in Enfield. In interviews conducted by PRI staff, college officials explained that the Enfield Chamber of Commerce contacted school administrators and asked why no type of manufacturing program was offered since the region had a need for skilled workers in this area. Consequently, college officials met with the Enfield Economic Development Director, developed a noncredit manufacturing program in six months, and then launched the program.

The college decided to offer the manufacturing program for credit once it was up and running in order to provide a career pathway for individuals who wanted to go on to a higher degree as well as make students eligible to cover expenses through Pell grants. College officials believe that one reason the program is successful in placing students is that a six-month internship is offered and students are placed with employers that will likely hire them upon completion of the program. There are two program advisory boards – the Electronics Advisory Board and the Precision Machining Advisory Board – both comprised of manufacturing employers in the region.

[18] The Federal Pell Grant Program provides need-based grants to low-income undergraduate and certain postbaccalaureate students to promote access to postsecondary education.

Table IV-3. Program Advisory Council Affiliations (Total Statewide).		
Affiliation	**Number**	**Percent**
Business	34	13%
Financial	31	12%
Labor	2	<1%
Industry	8	3%
Technical Occupations	4	2%
Other	1	<1%
Management	8	3%
Professional (architect, education, engineer, health tech, legal, computer, entertainment, media, social services, scientist, other)	101	40%
Service Occupations	17	7%
Sales	10	4%
Office/Admin Support	6	2%
Installation/Maintenance/Repair	2	<1%
Production	2	<1%
Transportation	0	-
Public Service	24	9%
Community Service	5	2%
Total Members Statewide	255	100%
Source: Board of Trustees of the Community Colleges		

Articulation/Transfer agreements. If producing workers with more education and critical thinking skills is important for employers, then state policies that make it easier for students to pursue higher education are also important. Articulation and transfer agreements are formal agreements between postsecondary institutions that maximize the number of credits the student may transfer. Specifically, the agreements allow a student to apply credits earned at one institution toward advanced standing, equal transfer, or direct entry into specific programs at another institution. They provide incentives to students for advancing from a lower degree level to a higher level, by automatically accepting coursework completed at the lower level at the time of transfer, and provide guaranteed pathways to a bachelor's degree at another.

The Connecticut Community College System and the Connecticut State University System (CSUS) developed a Transfer Compact that offers, beginning in fall 2009, Dual Admission (a specific type of transfer agreement) to students who are planning to enroll at a CSUS university after completing an associate's degree. The Dual Admission program is designed for students who:

- plan to earn an associate's degree from one of the 12 Connecticut Community Colleges (in five years or less);
- plan to pursue a bachelor's degree at one of the four Connecticut State University System institutions, beginning within two years of completing an associate's degree; and

- have earned 15 or fewer transferable college credits at the community college at the time of application.

Since 2007, the University of Connecticut also has guaranteed admission for persons graduating from Connecticut's community colleges who fulfill certain requirements. Called the Guaranteed Admissions Program, these students are admitted to any UConn campus provided they complete an associate's degree and have at least a 3.0 (B) grade point average in a liberal arts or other approved major (horticulture, veterinary technician, and environmental engineering technology).

Several of the community colleges also have established separate articulation agreements with Connecticut and out-of-state independent colleges and universities, but these have been initiated at the individual college, rather than system, level.

Most of the community colleges also have articulation agreements with Connecticut's Technical Schools, at least in some areas. As part of this study, the program review committee examined the pathways that exist for technical school graduates to gain admittance into the state's public colleges and universities. More information on these pathways is presented in Appendix D.

Connecticut State University System. As shown in Figure IV-1, the Connecticut State University System (CSUS) comprises four universities located in four different regions of the state (Danbury, New Britain, New Haven, and Willimantic). All of the universities in the system began as "normal" colleges for teacher training.

In fall 2008, there were 35,891 undergraduate and graduate students enrolled in the system, and 93 percent of the students were from Connecticut. Undergraduates accounted for 82 percent of the total enrolled. There are over 160 programs of study offered at a range of levels: baccalaureate, master, and sixth year programs.

The system is governed by a board of trustees and a chancellor, and each college has a president. The board has 18 members, 14 of whom are appointed to six-year terms by the governor and four elected by their peers, one from each of the universities. The board appoints the system's chancellor and each university's president, and develops mission statements for each university, which require approval by BGHE. As noted above, it is responsible for establishing rules for governing the state system.

University of Connecticut. The University of Connecticut is the state's flagship institution of higher learning. The University was founded in 1881 as the Storrs Agricultural School and became the University of Connecticut in 1939. The University has ten schools and colleges at its main campus in Storrs, separate Schools of Law and Social Work in Hartford, five regional campuses throughout the state, and Schools of Medicine and Dental Medicine at the UConn Health Center in Farmington.

In fall 2008, there were 29,383 undergraduate and graduate students enrolled in the system. Undergraduates accounted for 73 percent of the student body. There are 14 schools

and colleges, with 100 undergraduate majors, 91 graduate fields of study, and 5 professional degree programs.

The university is governed by a 21-member Board of Trustees, of which the governor appoints 12 members, and students and alumni elect two members each. There are five ex-officio members: the governor; the commissioners of agriculture, economic and community development, and education; and the chair of the UConn Health Center Board of Trustees. Like the boards for the community college and CSU systems, the UConn Board is responsible for governing the university and developing a mission statement for it, including the role and scope of each branch campus. The board also coordinates branch and institutional services and programs.

Charter Oak State College and Distance Learning. In 1973, the Connecticut legislature established Charter Oak State College to provide an alternative way for adults to earn associate and bachelor's degrees. Charter Oak is a distance learning college offering video and online courses for a personalized degree. Degree requirements are satisfied in several ways. Students may earn college credits through:

- courses transferred from other regionally accredited colleges and universities;
- certain standardized tests;
- certain corporate and agency training programs;
- military service schools and occupational ratings evaluated by the American Council on Education (ACE);
- faculty-evaluated licensures/certifications;
- contract learning (independent study);
- experiential learning; and
- Connecticut Credit Assessment Program (CCAP).

There are about 2,000 students enrolled with the college, representing all 50 states and 9 countries.

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Chapter V

Linking the Postsecondary Education System to Employer Need

The current state organizational structure to facilitate the coordination of postsecondary education with workforce development involves a myriad of agencies, boards, higher education institutions, offices, councils, and commissions. State agencies concerned with examining workforce demand and/or sustaining Connecticut's economic viability include the Departments of Labor, and Economic and Community Development, and the Office of Workforce Competitiveness. In addition to these entities, there are numerous formal and informal public/private partnerships that explore ways to better develop Connecticut's workforce at the local, regional, and state levels. Some have overlapping responsibilities, but there is no single entity with authority to implement across-the-board strategies, policies, or programs.

This chapter describes the roles and responsibilities of the:

- state agencies responsible for workforce development;
- public higher education system in considering workforce needs; and
- coordinating entities that have been established to better link the postsecondary education system with Connecticut's workforce development needs.

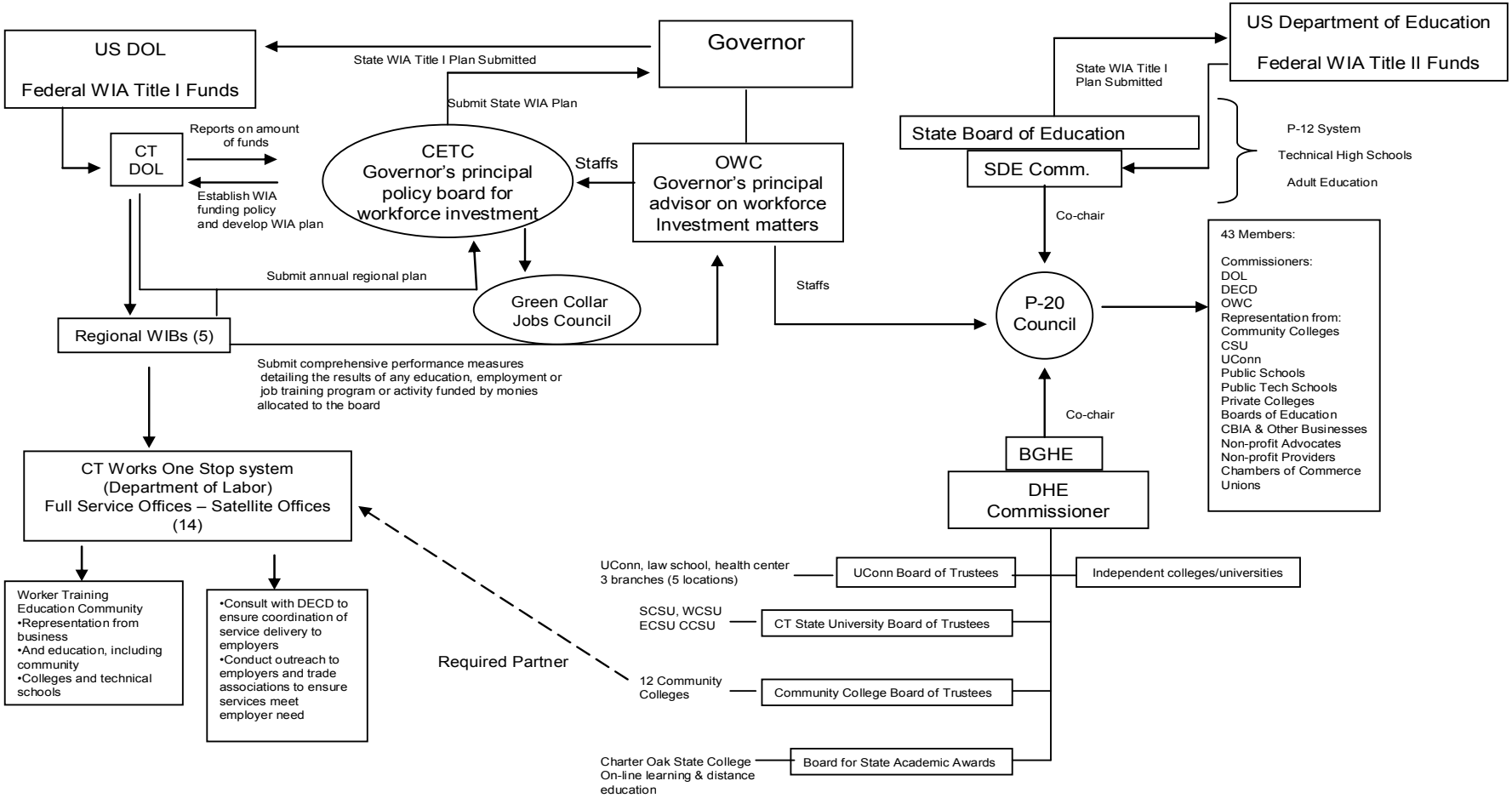
It also describes the numerous boards and commissions involved in identifying, establishing, or implementing strategies and/or programs created to foster alignment between postsecondary education and employer need.

Executive and legislative branch initiatives to better coordinate postsecondary education with workforce development can be traced back to the early 1980s. Thus, creating alignment between the types of graduates produced by Connecticut and the types of graduates needed by employers to keep Connecticut competitive has been a persistent concern of policymakers.

In addition to efforts by policymakers to require alignment through legislation, there are also numerous linkages that exist outside of the statute between independent postsecondary institutions, business organizations, and individual employers. However, no compendium of all these efforts has ever been compiled nor an assessment made of the strategies that lead to better outcomes. One goal of this study was to determine whether a more systemic approach to promote the alignment of postsecondary education and the employment needs of Connecticut's businesses is required instead of the current decentralized system.

Figure V-1 identifies the key players in aligning postsecondary education with the needs of Connecticut's employers. The figure shows the relationship between the various

Figure V-1. Current Organizational Structure for Alignment of Postsecondary Education and Workforce Development



Source: OWC & PRI committee staff

agencies, offices, boards, and departments.

The entire public system for workforce development in Connecticut is shown in the figure in order to convey its complexity. It is important to remember that many of these agencies/entities have multiple responsibilities and creating alignment between the higher education system and the needs of employers is only one of their roles. The Department of Economic and Community Development is not depicted in the figure because its role focuses on promoting innovative research and new competitive industry niches to foster growth in Connecticut's economy. Each of the entities' roles and responsibilities, as they are related to this study, are described below.

Role of the Department of Labor in the Workforce Development System

Connecticut Department of Labor. The Connecticut Department of Labor (DOL) is the state's lead agency for producing information and statistics on the economy, workforce and occupation demand, and growth in industry sectors. It also is the state agency responsible for administering a variety of federal and state employment service programs, and regulating and enforcing working conditions, wage standards, and labor relations.

Its main roles in the workforce investment system are: statewide planning, funding, and monitoring duties required by state and federal law for a number of employment and training programs; managing, with the regional workforce boards, the state's one-stop center network; and administering the Jobs First Employment Services (JFES) program, the employment portion of the state's welfare-to-work program.

Most of the efforts by DOL are related to implementation of grants and/or training requirements for programs aimed at specific populations not the focus of this study: youth, welfare-to-work, and disadvantaged/displaced workers. However, the flow of federal Workforce Investment Act funds is depicted in Figure V-1 because it is a part of Connecticut's overall workforce development system, and through its programs, produces a supply of workers that can be considered a resource for employers.

Particularly relevant to the PRI study, DOL is statutorily required to develop future workforce demand projections by surveying the state's employers and forecasting the number and types of openings that will be available for a wide range of occupations. (Chapter VI reviews the challenges of forecasting employer needs.) The occupational information developed by DOL is distributed through the Connecticut Career Resource Network (CCRN), which is the state's counterpart to the federal America's Career Resource Network. Information is distributed through CCRN to the education community, teachers, guidance counselors, students, parents. and other individuals interested in job outlook information. The goal of the network is to "improve career decision-making by students and other individuals, and to support life-long learning."

DOL undertakes career-related activities, including publishing documents, holding workshops and conferences, and maintaining web-based information systems. In interviews conducted by PRI staff, it was not clear how this information was specifically being used by high

schools, colleges, and universities as part of their advising roles in student career services. Some of those interviewed cited the difficulties in using data that projected job shortage areas 10 years out, as factors, such as the economy or new technologies, could impact the reliability of these projections. They noted however, that it was used as a broad guide for areas that will need workers in the future.

Finally, the commissioner of the Department of Labor (or designee) is a statutory member of four inter-agency commissions, councils, and boards that seek to coordinate education and jobs, which are identified and described later in this chapter.

Coordinating Bodies for Aligning Postsecondary Education and Employer Need

For almost 30 years, there have been proposals and efforts intended to create linkages between the higher education system and the development of the state's workforce to better met the needs of the state's employers. As noted in the Introduction, these moves began as early as 1982, when the Governor's Commission on Higher Education and the Economy recommended the governor annually appoint a Committee on Technological Change representing business, labor, industry, and government that would report on technological change and its effect on employment opportunities in Connecticut.

More recently, governors through executive orders have created new state entities and public/private partnerships charged with fostering alignment. Under Executive Order No. 14, Governor Rowland established two new entities, partly in response to federal passage of the Workforce Investment Act, but also to better prepare Connecticut's workforce for the economy of the 21st Century. The order created the Office of Workforce Competitiveness (OWC) and the Governor's JOBS Cabinet.

The Office of Workforce Competitiveness is still in existence while the JOBS cabinet was rescinded by Governor Rell through Executive Order No. 2A and replaced with The Connecticut Commission for the Advancement of 21st Century Skills and Careers. Governor Rell has also created a new coordinating entity to prepare Connecticut to capitalize on green collar jobs. These bodies are described in this chapter and their relationships are also depicted in Figure V-1.

Office of Workforce Competitiveness. The Office of Workforce Competiveness was established by Executive Order No. 14 on April 12, 1999. Recognizing a link between business needs and higher education, and that a skilled workforce is essential to the state's economic viability, the order created OWC (along with the Governor's JOBS Cabinet) to focus on the need to prepare the state's workforce for the new century.

OWC was made a statutory agency within the Office of Policy and Management for administrative purposes only under P.A. 00-192. The office is headed by a director who reports directly to the governor. The office serves as the governor's principal workforce development policy advisor. It is charged with providing advice to the governor on workforce investment matters, serving as liaison between the governor and various federal, state, and local entities, and coordinating the workforce development activities, including WIA, of all state agencies. In FY

08, the office had 4 FTE staff and expended almost $6.5 million for pilot programs, other initiatives that promote workplace competitiveness, and staffing.

The office also provides staff support to the Connecticut Employment and Training Commission (CETC) and The Connecticut Commission for the Advancement of 21st Century Skills and Careers.

Statutorily, OWC is required to provide the governor and legislature, with the assistance of DOL, necessary reports, information, and assistance to any state agency. The office has completed 42 reports since 2001, many of them aimed at identifying strategies to build talent to address critical shortage areas or emerging fields. A list of reports completed by the office is contained in Appendix E.

The OWC staff also heads up a number of other initiatives including administering targeted pilot programs and chairing several interagency committees required by statute. Other statutory responsibilities particularly related to the alignment of postsecondary education and employment, are:

- serving as the lead agency for the development of employment and training strategies and initiatives required to support Connecticut's position in the knowledge economy; and
- annually submitting a report, with the assistance of DOL, to the Governor and the legislative committees of cognizance (education, economic development, labor, and higher education and employment advancement) based on a forecasted assessment by DOL of workforce shortages in occupations in this state for the succeeding two and five year periods. The report must include recommendations concerning:
  - methods to generate a sufficient number of workers to meet identified workforce needs, including scholarship, school-to-career, and internship programs; and
  - methods secondary and higher education and private industry can use to address identified workforce needs.

OWC statutory committees, boards, and commissions. Connecticut law requires that the OWC director serve as chair or member of a variety of committees, boards, and commissions relevant to the alignment of postsecondary education and workforce development. For the entities that the office chairs, committee membership is delineated in statute and typically includes several state agencies and public members with expertise in certain fields (see Table V-1).

Pilot programs. The office also administers several grant programs with the purpose of increasing skills in a specific occupational shortage area or providing incentives through student loan reimbursement programs to encourage individuals to enter shortage fields. These programs are shown in Table V-2.

Table V-1. Statutory Committees Chaired by OWC Director			
Name	**Membership**	**Alignment-Related Purposes and Objectives**	**Meeting Frequency**
CT Career Ladder Advisory Committee	13 members: • OWC director • commissioners of SDE, DHE, DPH, DOL (or designees) • 9 public members with expertise in early childhood education, health care, labor market analysis, health care employees, or early childhood education employment, and 3 members with workforce development expertise	The committee's purpose is to: • promote the creation of new career ladder programs and the enhancement of existing programs for occupations in this state with projected workforce shortages OWC must consult with the Permanent Commission on the Status of Women.	Bimonthly

CT Allied Health Workforce Policy Board	13 members:
	• OWC director
	• commissioners of DPH, SDE, DHE (or designees)
	• chairs and ranking members of Public Health, and Higher Education and Employment Advancement Committees (or designees)
	• a member of the State Board of Examiners for Nursing
	• Connecticut Conference of Independent Colleges
	• Various recognized experts in field of allied health, finance, economics or health facility management appointed by the leaders of the General Assembly
		The board is required to:
		• act in coordination with the Connecticut Career Ladder Advisory Committee
		• monitor data and trends in the allied health workforce including:
		  o current and future supply and demand
		  o capacity of the state's higher education system to educate and train students pursuing allied health professions; and
		  o recruitment and retention strategies for students and employers
			Not stated but board is active, submitted annual 2009 report to committees of cognizance with findings and recommendations to address allied health workforce shortages in CT

Council of Advisors on Strategies for the Knowledge Economy	11 Members: • OWC director • commissioners of DECD, DHE, DOL • OPM secretary • executive directors of CT Innovations, Inc., and the Connecticut Development Authority • 4 representatives of the technology industry appointed by leaders of General Assembly	The council's purpose is to: • promote formation of university-industry partnerships, identify benchmarks for technology-based workforce innovation and competitiveness, and advise the award process for innovation challenge grants to public postsecondary schools and their business partners • administer grants to generate talent in institutions of higher education	Never active: Grants never funded

Industry Advisory Committees for Career Clusters within Technical Schools and the Community College System	• OWC, in consultation with Superintendent of Technical Schools, must create an integrated system of statewide industry advisory committees for each career cluster offered as part of Technical School and Community College Systems
	• Committee representation must include industry representatives of the specific career cluster
		• Each committee, with support from OWC, the Technical School and Community College system, and SDE, is required to establish for each career cluster:
		  o specific skills standards;
		  o corresponding curriculum; and
		  o a career ladder which shall be implemented as part of the schools' core curriculum.
			No statewide committees are active but Technical Schools have regional committees

Source: Connecticut General Statute and OWC			

Table V-2. Statutory Programs Administered by the Office of Workforce Competitiveness							
Name of Program or Pilot		**Statutory Citation**	**Public Act**	**Funded (y/n)**	**If Funded, State Appropriation by FY**	**No. Students Served**	**No. Students Completing Requirements**
Technology Assessment Examination Program – 2-year pilot program (FYs 02 and 03)	**Evolved into the CT Career Choices Program (CCC)**	4-124x	01-193	**Yes**	FY 08 - $800,000 **FY 09 - $760,000**	**Since its inception in FY 05:** **50 high schools have offered one or more CCC courses involving nearly 6,000 students and 125 teachers** **Almost 100 experiential learning activities reached over 400 students**	
Information Technology Credential or Degree Program		4-124y	01-193				
Information Technology Internship and Work-Study Program		4-124aa	01-193				
Career Ladder Programs – provide funding for career ladder programs to encourage students to enter occupations with projected workforce shortages for the next five years		4-124cc	03-142	**Yes**	FY 08 - $500,000 **FY 09 - $475,000**	no data available	no data available
Connecticut Nursing Faculty Incentive Program		4-124ee	04-196	**Yes**	FY 05 - $75,000 FY 06 - $50,000	**26 students were supported through this two-year program and received nursing education credits**	
Innovative Challenge Grant Program	**Same program**	4-124ff	04-212 05-198	**No**	not applicable		
Grant Program to Generate Talent in Higher Education Institutions		4-124hh	2005				
Program regarding Trained Workforce for the Film Industry		4-124uu	2007	**Yes**	FY 08 - $1,000,000 **FY 09 – $950,000**	**FY 08 – 149** **FY 09 – 121 (Training sites reduced from 3 to 2 in FY 09)** **Aerial Lift Training - 49**	

Source: Office of Workforce Competitiveness, PRI Committee

Connecticut Employment and Training Commission (Designated State-level Workforce Investment Board). The Connecticut Employment and Training Commission (CETC) was created in 1989 by P.A. 89-292 with a mandate to plan, coordinate, and evaluate state sponsored job training programs. It was designated as the state-level Workforce Investment Board, required by federal law under the Workforce Investment Act of 1998 (WIA). Statutorily, CETC has 24 members with the majority of its membership from business and industry, and the remainder representing state and local government, organized labor, education, and community-based organizations. Originally located within DOL, the commission was transferred to OWC effective July 1, 2000 and since then OWC has been responsible for staffing the commission.

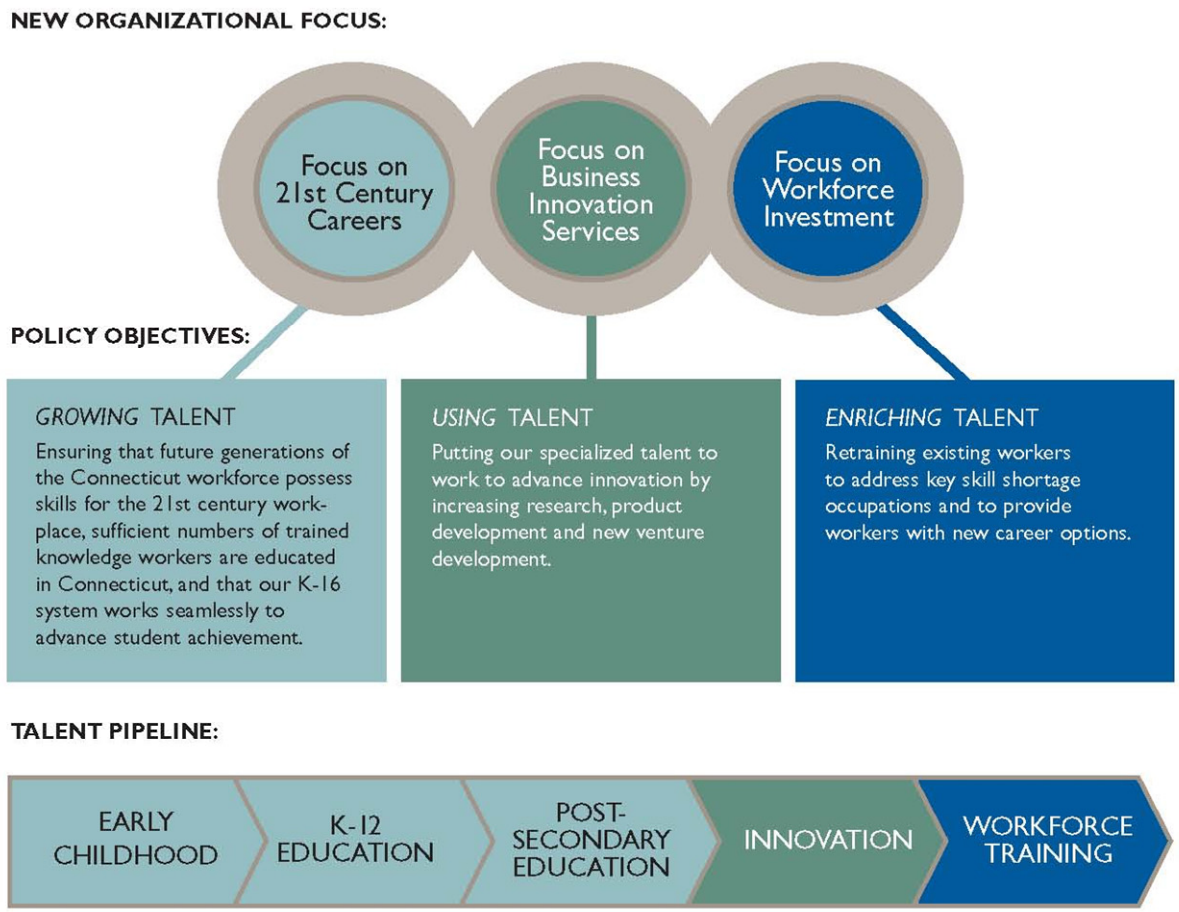
Although CETC is the governor's principal policy board for workforce investment – the education, training, and retraining of the current and future workforce - much of the commission's focus is on funding training and employment programs through grants provided under the Workforce Investment Act of 1998 (WIA). WIA provides federal grant funds that target employment and training programs around three populations – dislocated workers, unemployed adults, and disadvantaged youth – that are not the subject of this study. There are many different types of training programs available to individuals who are eligible for WIA grant funding, including programs offered through Connecticut's one-stop centers that have on-site training and job placement assistance, as well as programs available through the community college system. Under WIA, community colleges are required to partner with Connecticut's one-stop centers.

In recent years, the commission has approached its role more broadly in its examination of Connecticut's workforce investment system. The commission is required to: 1) annually report on the status of policies, programs, and investments intended to build and sustain a skilled state workforce to the governor and legislature, and 2) develop a federally-required education and job training report card that assesses the accomplishments of the state workforce investment system. Both requirements were blended into CETC's 2009 Annual Report to the legislature.

The 2009 CETC annual report cites several key indicators that raise concerns about the state's future workforce. These include demographic trends showing an aging workforce with a younger, less skilled working population available to replace it, poor student achievement in science and math, poor urban school performance, and too few college graduates in science and engineering. To address these challenges, the commission proposes a "talent-based strategy built on the foundation of a talent pipeline." This strategy, the official workforce development policy for Connecticut, is promoted by the Office of Workforce Competitiveness and was adopted by the governor in her submission of the State's Strategic Two-Year State Workforce Investment Plan (July 1, 2007 – June 30, 2009) to the U.S. DOL.

Talent-Based Strategy to Keep Connecticut Competitive in the 21st Century. The components of the strategy include fostering the "talent pipeline" so that an "integrated continuum of education and workforce training systems and strategies [are] coordinated to meet the objectives of a growing and competitive state economy." Figure V-2 conceptually outlines the talent-based strategy, which includes three parts:

Figure V-2. Strategic Approach to Building Connecticut's 21st Century **TALENT PIPELINE**



Source: OWC

- **Growing Talent** – ensuring future workers have the necessary skills to enter the 21st workforce. Responsibility for growing talent falls to the three education systems: early childhood, K-12, and postsecondary;
- **Using Talent** – using skills gained to increase research, product development, and new venture development; and
- **Enriching Talent** – retraining existing workers to obtain skills necessary to enter occupations in critical shortage areas.

CETC's 2009 annual report emphasizes the importance of postsecondary education in recommending that:

> *all Connecticut workers should have the equivalent of at least two years education or training beyond high school leading to an associate's degree, a comparable vocational credential, or similar industry certification, including demonstrable competence in core academic, STEM, and 21st century skills to compete in the workplace, thrive financially and contribute productively as a taxpayer, citizen and consumer.*[19]

The report also acknowledges that coordination is a key ingredient of an effective workforce development system. This includes coordination and collaboration across state agencies and universities, among employers, and within higher education institutions.

Executive Order No. 23 regarding green collar jobs. An example of a new collaborative effort that furthers alignment of postsecondary education graduates with emerging needs identified by employers is detailed in Executive Order No. 23. The order, which is discussed in detail in Chapter VII, was issued on February 2, 2009 by Governor Rell and noted the need to design initiatives and programs to spur the growth of green collar jobs in Connecticut.

The Connecticut Commission for the Advancement of 21st Century Skills and Careers. The Connecticut Commission for the Advancement of 21st Century Skills and Careers was created under Executive Order No. 2A and is informally called the P-20 Commission. It is the successor to the voluntarily-formed PK-16 council that had existed since January 2007. The preamble to Executive Order No. 2A, which eliminated the Governor's JOBS Cabinet and replaced it with the P-20 Commission, emphasizes the need to create an effective education and career pipeline that maximizes the number of skilled people in Connecticut with a postsecondary degree or other credential. The commission is charged with:

- developing a public policy framework for state leaders that increases collaboration across the systems at their current and potential points of intersection;
- exploring how the systems can work more effectively together to deliver services; and
- realigning existing activities and operations in a way that makes the education pipeline more responsive to the diverse needs of students.

[19] *A Talent-Based Strategy for Economic Competitiveness*, CETC 2009 Annual Report/Card.

The order recognizes that growing talent is not the responsibility of a single agency, and states that multiple agencies must collaborate for this unified purpose. The order requires the commissioners of DHE and SDE to co-chair the commission and appoints the commissioners of DOL, DECD and OWC as members, with OWC as staff. The commissioners of SDE and DHE are given the authority to appoint any additional commission members. Currently, there are 43 members, including representatives from the fields of early childhood, K-12, and higher education; the workforce system; other state agencies; businesses; and philanthropic and community-based organizations.

Since January 2009, the commission has held two meetings and has another scheduled in March 2010. At the introductory meeting, issues that Connecticut needs to resolve in order for students to make successful transitions from middle school and high school into postsecondary education were discussed. Ultimately, commission members decided to consider examine ways to foster collaboration among four systems:

- early childhood;
- K-12;
- higher education; and
- workforce training.

At the June 10, 2009 meeting, the commission decided to break into three workgroups. The focus of the first is on data systems and determining the types of information that should be tracked from early childhood through the postsecondary system. (The legislature adopted P.A. 09-241 that allows for longitudinal tracking by assigning a unique student identifier to each student.) The second workgroup will focus on teacher effectiveness in the K-12 system and teacher preparation in the postsecondary system. The last group will focus on existing regional partnerships to identify successful efforts at coordination between the four systems and whether there are best practices that should be applied on a statewide basis.

Recently Defunct or Never Active Coordinating Bodies

Two coordinating bodies were created within the last ten years, one by executive order and one through legislation. Both were intended to align postsecondary education and employment. One of these coordinating bodies is defunct and was replaced by the P-20 Commission, while the other was never active. They are described below to show the attempts made by both the executive and legislative branches of government to address the decentralized nature of education, postsecondary education, and workforce development, through establishing entities that span the three areas.

The Governor's JOBs Cabinet. The Governor's JOBs Cabinet, created in the same executive order as OWC, was mandated to "*explore, identify and report on policies and actions necessary to ensure that Connecticut leads the nation in building a trained and employed workf*orce." The cabinet could be chaired by either the governor or the OWC Director and included: the commissioners of labor, economic and community development, education, and social services; the secretary of OPM; and the chancellor of Connecticut's community college

system. Its membership was expanded under Executive Order No. 2 in November 2004 to include DHE, the chancellor of the Connecticut State University System, the presidents of UConn and UConn Health Center, the president of the Connecticut Conference of Independent Colleges, and the presidents of the Connecticut Development Authority and Connecticut Innovations, Inc., two quasi-public agencies.[20]

The OWC executive director indicated in PRI staff interviews that the council became less effective as it grew larger, so informal meetings occurred among some members on an ad hoc basis. No minutes of these meeting were kept. In January 2009, Governor Rell eliminated the cabinet under Executive Order No. 2A and replaced it with the Connecticut Commission for the Advancement of 21st Century Skills and Careers, otherwise known as the P-20 Commission, described above.

Blue Ribbon Task Force. In 2007, the legislature created a Blue Ribbon Task Force to develop and implement a strategic master plan for higher education in Connecticut by October 1, 2008. The law requires the plan to contain short-term and long-term state goals for higher education and include benchmarks for achieving those goals by 2010, 2015, and 2020. The law also requires the commission to biennially submit a report prepared by the Department of Higher Education on the implementation of the plan and progress made in achieving the strategic plan's benchmarks to the governor and the General Assembly. The task force is scheduled to terminate on January 1, 2021.

In the FYs 08-09 Biennial Budget, $100,000 was appropriated each year for developing the strategic master plan for higher education. To date, the commission has not been constituted; funds lapsed the first year and were rescinded the following year.

Relevant to the PRI study, and as part of its charge, the task force is required to:

- examine the impact of demographics and workforce trends on higher education in the state;
- address the challenges related to increasing the number of students earning bachelor's degrees in the state, increasing the number of young people entering the state's workforce, and eliminating the disparity in the achievement gap between minority students and the general population;
- recommend ways in which the state's higher education institutions can, consistent with their respective missions, expand their role in advancing the state's economic growth; and
- review the higher education board of governors' master plan for higher education and strategic plan for racial and ethnic diversity, and the Nellie Mae

[20] The Connecticut Development Authority provides debt financing and investment capital to help businesses grow in Connecticut. Connecticut Innovations Inc. provides strategic capital and operational insight to push the frontiers of high-tech industries such as energy, biotechnology, information technology, and photonics.

Foundation report titled, "New England 2020: A Forecast of Educational Attainment and its Implications for the Workforce of New England States. "

In developing the strategic plan, the task force is to consider several factors including partnering public higher education institutions with the business community to move students into workforce shortage areas, and developing strategies to promote and measure retention and graduation rates.

Task Force Membership. The 36-member task force is to consist of 16 voting members and 18 ex-officio nonvoting members. Representation is to be selected from a wide variety of education, business, and cultural interests. Membership includes key state agency commissioners, the executive director of OWC, Board of Trustee chairpersons and presidents of public colleges and representation from the Connecticut Conference of Independent colleges. A unique feature of the task force, different from the other coordinating bodies described above, is that it includes the chairs and ranking members of the legislative Committee on Higher Education and Employment Advancement as ex-officio members of the task force. Table V-3 shows the appointed voting members and their appointing authorities.

Reporting. The act requires the task force to complete and submit its strategic master plan for appropriate legislation and funding by October 1, 2008. The act also requires the commission biennially to submit, between January 1, 2009 and January 1, 2021, a report prepared by DHE on the implementation of the plan and progress made in achieving the strategic plan's benchmarks. Both are to be submitted to the governor, and the Higher Education and Employment Advancement, Education, Commerce, Labor, and Appropriations Committees.

Newly Proposed Coordinating Body

In September 2009, Governor Rell released the state's first-ever *Economic Strategic Plan* developed by the Department of Economic and Community Development. A section of the plan states that the way for the state to remain competitive is by growing talent and being prepared for the technological jobs of the future. To accomplish this, there are several strategies identified in the plan. To provide oversight and ensure implementation, the governor proposed a new Workforce and Education Cabinet be established.

The cabinet would consist of the following members: the commissioners of SDE, DHE, DOL, and DECD (or designees); the secretary of OPM (or designee); the heads of OWC, the Connecticut Development Authority, and Connecticut Innovations, Inc.; and the chairs of the State Board of Education, and the Board of Governors for Higher Education; and the boards of trustees of UConn, UConn Health Center, Connecticut State University System and the state community college system.

Among the strategies the cabinet would provide oversight for, that are related to this study, are: 1) building the capacity for economic and workforce analysis, including examining occupational supply and demand information; and 2) increasing the number of postsecondary students seeking degrees in STEM areas, by creating a $100 million, public-private student loan

partnership, offering loan forgiveness in critical shortage occupations such as science and engineering.

Table V-3. Task Force Members		
No.	**Appointing Authority**	**Appointees**
2	House speaker	• Former administrators or faculty members of independent higher education institutions
2	Senate president pro tempore	• Former UConn administrator or faculty member • Former community-technical college administrator or faculty member
2	House majority leader	• Former state university administrator or faculty member • Former Charter Oak State College administrator or faculty member
2	Senate majority leader	• Representative from the arts and culture field
2	House minority leader	• Persons knowledgeable about science and technology
2	Senate minority leader	• Representatives of statewide business organizations
4	Governor	• Representative from a nonprofit education foundation • Person experienced in university research and its commercial application • Person experienced in preK-12 education • One additional person
Ex-Officio Non Voting Members		
Chairpersons and Ranking Members		Committee on Higher Education and Employment Advancement
Commissioners		DHE, SDE, DECD, DOL
Chairpersons and CEOs of each public higher education institution		UConn, CSU, Community Colleges, Board for State Academic Awards
Chairperson and President		Connecticut Conference of Independent Colleges
Director		OWC
Secretary		OPM
Source: P.A. 07-3, JSS		

Chapter VI

Barriers to Alignment of Postsecondary Education and Employment

This chapter discusses and makes recommendations to overcome some of the possible barriers to aligning postsecondary education and employment. These barriers may be grouped into five general areas related to: 1) elementary and secondary school students in the knowledge/talent pipeline; 2) postsecondary education institutions; 3) difficulty in making accurate demand projections; 4) current economic challenges; and 5) state agency organization, programs, and policies. The chapter concludes with a review of migratory patterns of college-educated residents and the degree to which this is contributing to a "brain-drain" in Connecticut.

1) Barriers Related to Elementary and Secondary School Students

Prior to any postsecondary education, elementary and secondary school students must be well-prepared for the upcoming work they will face in college. There are signs that U.S. students are not as strong in science as children in many other countries. Within Connecticut, fourth and eighth graders do not score as well as students in other New England states. This is contributed to, in part, by the widening performance gaps across economic, gender, and racial/ethnic groups. This lack of preparedness is borne out in the substantial proportion of college freshmen required to take remedial courses.

The preparedness of U.S. high school graduates for college level coursework has been assessed in a variety of ways, from remedial coursework required when entering college to international, national, and state comparisons of performance in science, math and reading literacy, necessary ingredients for STEM occupations.

Science literacy performance of the United States. One of the indicators the U.S. Department of Education reported on in its report, *2008 Condition of Education in the United States*, is the science literacy level of 15-year-olds around the world as measured by the Program for International Student Assessment (PISA). With average performance scaled to a score of 500, Table VI-1 shows how U.S. students compare to their peers in the 30 industrialized countries belonging to the intergovernmental Organization for Economic Cooperation and Development (OECD) and 27 non-OECD countries. More than half (16) of the OECD-member countries and 6 non-OECD-member countries or jurisdictions had significantly higher science literacy scores than U.S. students.

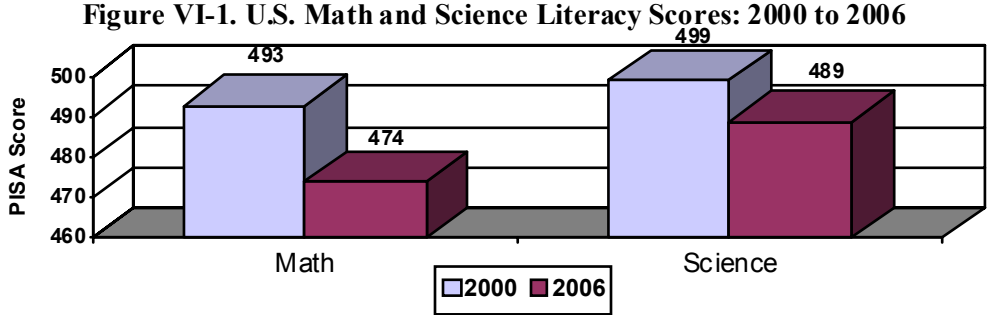
Math and science literacy PISA scores for the United States have decreased from six years ago. Figure VI-1 compares the average math and science literacy scores in 2000 and 2006 for 15- year-olds.

Table VI-1. International Science Literacy Performance: Average Combined Science Literacy Scale Scores of 15-Year-Olds by Country or Jurisdiction: 2006

Average Score Relative to U.S. Average Score	OECD-Member Country and Average Score					
Significantly higher	Finland	563	Netherlands	525	Switzerland	512
	Canada	534	Korea, Republic of	522	Austria	511
	Japan	531	Germany	516	Belgium	510
	New Zealand	530	United Kingdom	515	Ireland	508
	Australia	527	Czech Republic	513	Hungary	504
					Sweden	503
					OECD avg.	**500**
Not significantly different	Poland	498	Iceland	491	Spain	488
	Denmark	496	**United States**	**489**	Norway	487
	France	495	Slovak Republic	488	Luxembourg	486
Significantly lower	Italy	475	Greece	473	Mexico	410
	Portugal	474	Turkey	424		
	Non-OECD-member jurisdiction and average score					
Significantly higher	Hong Kong-China	542	Estonia	531	Slovenia	519
	Chinese Taipei	532	Liechtenstein	522	Macao-China	511
Not significantly different	Croatia	493	Lithuania	488		
	Latvia	490	Russian Federation	479		
Significantly lower	Israel	454	Thailand	421	Brazil	390
	Chile	438	Romania	418	Columbia	388
	Serbia, Republic of	436	Montenegro,		Tunisia	386
	Bulgaria	434	Republic of	412	Azerbaijan	382
	Uruguay	428	Indonesia	393	Qatar	349
	Jordan	422	Argentina	391	Kyrgyz Republic	322

Source: *Highlights From PISA 2006: Performance of U.S. 15-Year-Old Students in Science and Mathematics Literacy in an International Context,* U.S. Department of Education National Center for Education and Statistics

Figure VI-1. U.S. Math and Science Literacy Scores: 2000 to 2006



Source: *Organization for Economic Cooperation and Development, Program for International Student Assessment (PISA)* 2000, 2006

Math and reading performance of Connecticut fourth and eighth grade students. Leading up to student performance in secondary school, is student performance in primary school. The National Center for Education Statistics (NCES) is the primary federal entity that collects and analyzes data related to education. The Nation's Report Card provides a common measure for assessing educational progress across various subjects (e.g., reading and math) over time. The most recent scores are from 2007, with Connecticut ranked as high as fifth nationally on fourth grade reading scores, to as low as 28th on eighth grade math scores. Massachusetts, Vermont, and New Hampshire consistently rank above Connecticut on the four reading and math indicators (Table VI-2).

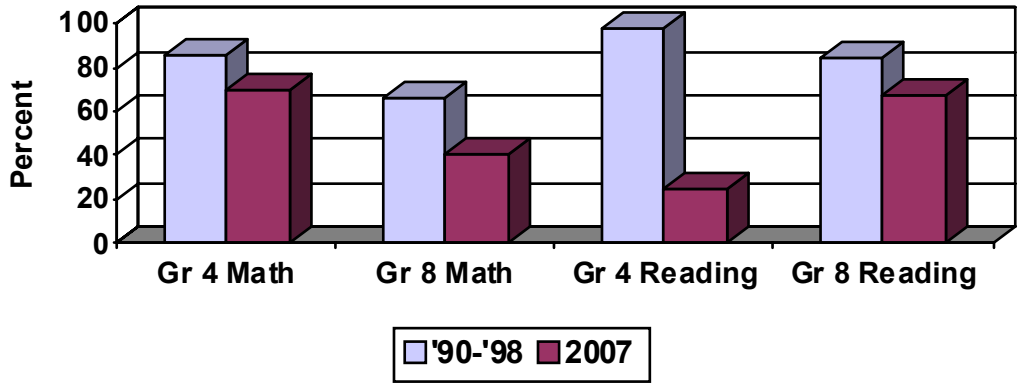
Table VI-2. State Ranking on Math and Reading Student Performance in 2007

State	Fourth Grade		Eighth Grade	
	Reading	Math	Reading	Math
Connecticut	**5**	**16**	**14**	**28**
Massachusetts	1	1	1	1
Rhode Island	34	39	39	38
Vermont	4	6	2	4
New Hampshire	3	3	6	9
Maine	11	19	5	12

Source: *2007 National Assessment of Educational Progress* (http://nces.ed.gov/nationsreportcard/)

Additionally, the performance of Connecticut's students declined from the 1990s to 2007 compared to that of children in other states (Figure VI-2). Fourth grade reading scores were higher than all but one state in the 1990s, but only higher than one-quarter of states by 2007. Part of this decline may be fueled by demographic changes; Connecticut's student population has increasingly larger percentages of students belonging to groups whose achievement has long lagged that of others.

Figure VI-2. Percent of States Connecticut Scores Above in Math and Reading



Source: http://nces.ed.gov/nationsreportcard

Preparedness of Connecticut low-income students for postsecondary education. As noted in the Office of Workforce Competitiveness talent pipeline report, an increasing number of Connecticut youth will reside in urban, low income settings. Preparedness of these students to fill workforce needs requiring postsecondary education is questionable given statistics contained in the most recent 2007 Nation's Report Card. A student's eligibility for free or reduced-price school lunch is used as an indicator of lower income.

With the exception of Washington, D.C., Connecticut's 2007 scores show the widest gap between higher- and lower-income students in the entire country (Table VI-3). This discrepancy has not changed over the past decade, and in the absence of strategies to address this issue, will most likely continue as urban, minority students become a larger percentage of the overall student population. There are also performance differences across gender and racial/ethnic groups on Scholastic Aptitude Tests (SATs), taken by older students who are considering postsecondary education.

Table VI-3. State Ranking on Gap Between Higher- and Lower-Income Student Performance in 1996 and 2007

State	Fourth Grade				Eighth Grade			
	Reading		Math		Reading		Math	
	1996	2007	1996 (N=44)	2007	1996	2007	1996 (N=41)	2007
Connecticut	**51**	**50**	**42**	**50**	**51**	**50**	**39**	**50**
Massachusetts	45	36	10	34	38	37	34	49
Rhode Island	34	40	28	38	43	47	27	44
Vermont	21	19	10	13	11	13	6	6
New Hampshire	13	15	-	4	5	6	-	13
Maine	6	7	5	7	1	1	5	3

Source: 1996 and 2007 National Assessment of Educational Progress (http://nces.ed.gov/nationsreportcard/)

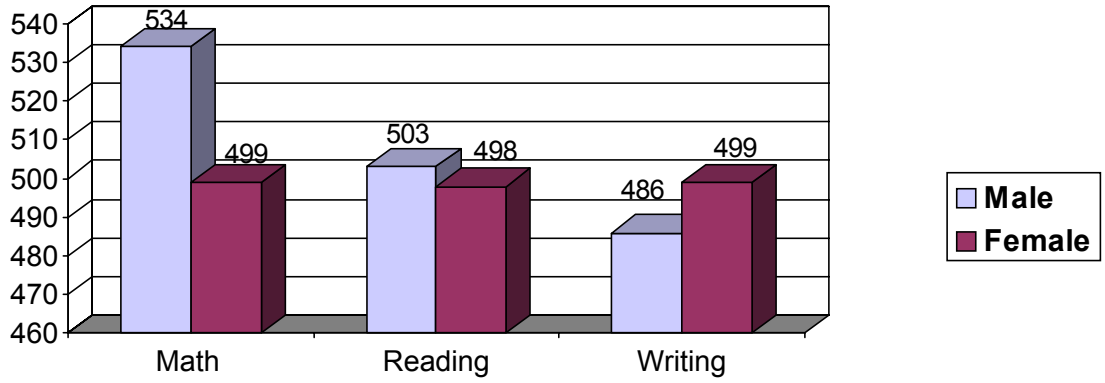
Differences in Connecticut SAT scores and graduation rates by gender and race/ethnicity. The College Board recently released the results of the Scholastic Aptitude Tests (SATs) for Connecticut's 2009 college-bound seniors.[21] Overall, males scored higher in math and reading, and females scored higher in writing (Figure VI-3). Asian and Caucasian students scored higher than Latino and African American students (Figure VI-4).

Despite their lower SAT scores, however, African-American women and Hispanic women were recently reported to have six-year college graduation rates (72% and 76%, respectively) close to the rate for white males (75%), while African-American men and Hispanic men had significantly lower graduation rates (59% and 66%, respectively).[22]

[21] On a scale from 200-800, the SAT assesses reasoning for college-bound students based on knowledge and skills in the areas of math, reading and writing.

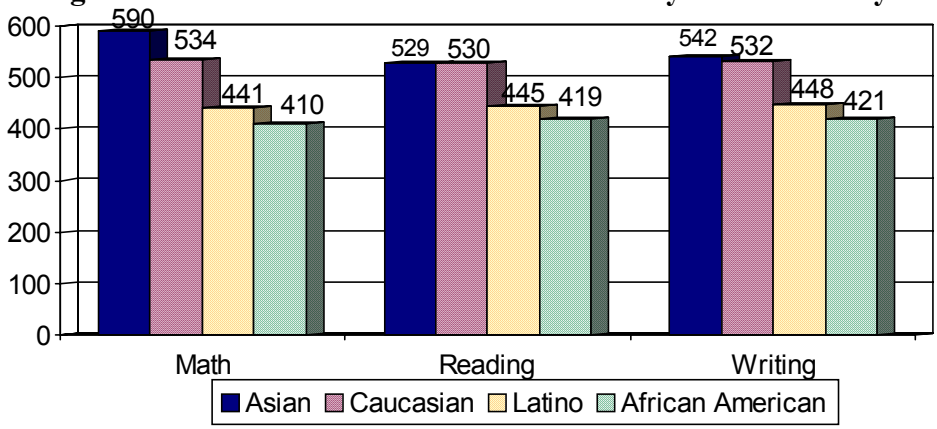
[22] Bowen, W. G., Chingos, M. M., & McPherson, M. S. *Crossing the Finish Line: Completing College at America's Public Universities*, Princeton University Press, 2009.

Figure VI-3. Differences in 2009 SAT Scores by Gender



Source: *CollegeBoard CT Profile Report of 2009 College-Bound Seniors*

Figure VI-4. Differences in 2009 SAT Scores by Race/Ethnicity



Source: CollegeBoard CT Profile Report of 2009 College-Bound Seniors

These discrepancies in performance may become even more problematic if predictions in the *New England 2020 Report*[23] come to fruition, where it is estimated that the increase in young minority workers in Connecticut and other southern New England states will account for almost 40 percent of all young workers by 2012, and 50 percent of all young workers by 2020. This lack of preparedness is borne out in the number of college freshmen required to take remedial level courses.

Preparedness of college freshmen for college-level coursework. In a nation-wide study of college freshmen by the U.S. Department of Education, National Center for Education

[23] *New England 2020: A Forecast of Educational Attainment and its Implications for the Workforce of New England States*, June 2006, Commissioned by Nellie Mae Education Foundation.

Statistics,[24] the percent of students reporting participation in remedial coursework varied by type of institution. Table VI-4 shows the greatest percent of postsecondary students reporting taking remedial courses in their first year of college were attending public community colleges. Regardless of type of college, math appeared to be the subject most frequently reported as requiring remediation.

Table VI-4. Percent of College Students Taking Remedial Courses During First Year

Remedial Course	Public Community College	Public Four-Year College	Independent Four-Year College
English	8.4%	5.2%	4.5%
Math	22.3%	13.9%	9.8%
Reading	10.0%	4.7%	3.8%
Study Skills	2.8%	1.9%	2.1%
Writing	9.6%	8.1%	7.3%
Any	28.6%	18.6%	15.2%

Source: U.S. Department of Education, National Center for Education Statistics, *2003/04 Beginning Postsecondary Students Longitudinal Study, First Follow-up*

Preparedness of students entering the Connecticut community college system is assessed by a performance indicator based on the percentage of students who successfully complete coursework in developmental mathematics. Table VI-5 shows the percent enrolled and percent passing basic mathematics skills developmental noncredit courses from the fall of 2000 through 2007. The most recent figures show approximately one in five community college students enroll in a remedial or developmental math course, and slightly more than half fail to pass the course. The community colleges have identified a performance improvement goal (to be achieved by 2011) of 60 percent of developmental math students passing the course.

Overall, approximately 25 percent of community college students are in developmental courses (including English and math) in any given semester. Of students who take the Accuplacer placement exam,[25] approximately 60-70 percent need remedial or developmental courses before completing their degrees.[26]

At the four Connecticut State Universities (CSUs), 62 percent of first-time, first year students were enrolled in a remedial or developmental math course in 2007.[27, 28] The CSUs

[24] *2003/04 Beginning Postsecondary Students Longitudinal Study, First Follow-up*.
[25] The Accuplacer placement test was developed by the College Board to determine the ability of entering students to be successful in college-level coursework, and whether one or more remedial courses are needed to improve their skills in reading, writing, or math. It is the test used by Connecticut's Community Colleges.
[26] Personal Communication, Mary Anne Cox, Assistant Chancellor, Connecticut Community Colleges, September 3, 2009.
[27] CSUS Student Characteristics- Fall 2007, Personal Communication, Teresa Boyd Cowles, Strategic Planning, Market Research, Institutional Research, Connecticut State University System Office, August 19, 2009.
[28] Remedial courses are for students who have not demonstrated proficiency in the subject area (e.g., math, English) and the remedial courses are noncredit courses. Developmental courses are for students who have demonstrated partial readiness or proficiency; developmental courses are credit courses, but they do not apply to general education graduation requirements.

believe there is a need to reduce remedial and developmental coursework by students entering the CSUS universities.

Table VI-5. Percent of Connecticut Community College Students Enrolled in and Passing Developmental Math Course

Year	# Enrolled in Community College	% Enrolled in Developmental Math	% Passing Developmental Math
2000	40,825	16%	51%
2001	42,642	17%	50%
2002	44,869	18%	55%
2003	45,160	19%	53%
2004	45,743	20%	50%
2005	46,227	19%	48%
2006	46,489	19%	48%
2007	48,434	19%	47%

Source: Connecticut State Department of Higher Education Report, *Higher Education Counts: Achieving Results*, 2006-2009

Recommendations to Overcome Barriers Related to Elementary and Secondary School Students

Strengthen high school graduation standards. In the recently proposed high school redesign of Connecticut's high schools, SDE stated the following vision for Connecticut high schools: "Each student entering high school will graduate as a contributing citizen in a democratic society, and be prepared for college and work in a global society." This will require schools to increase graduation requirements to be more reflective of the skills and knowledge needed to succeed in a global economy. The proposed redesign and subsequent 2009 legislation (H.B. 6488) recommended a *change from 20 to 25 credits required to graduate high school, including increases in mathematics, science, and world language requirements.* While the proposed redesign was not adopted, the Connecticut State University System passed BR# 09-17, a resolution concerning the admissions policy for first-time, first-year students, requiring incoming students to have taken four years of mathematics and English and three years of science by July 1, 2015.[29] *These more stringent requirements are necessary to prepare students for postsecondary education and the workforce needs of a global economy.* Therefore, the **program review committee recommends that:**

> **Connecticut should pass legislation reforming Connecticut high school graduation requirements as recommended by the State Department of Education in their proposed high school redesign.**

[29] BR# 09-17 Resolution concerning Admissions Policy for First Time First Year Students in the Connecticut State University System, March 12, 2009.

Increase efforts in high school to reduce the need for remediation in college. In a July 16, 2003 resolution, the CSUS Board of Trustees required students underprepared for college-level coursework in English and/or math, to demonstrate proficiency (i.e., pass remedial coursework) within their first 24 academic credits in order to register for any additional college courses.

CSUS efforts to reduce the need for remediation in college. Five years ago, in an effort to smooth students' transition from high school to college and decrease the number of students needing remediation in college, Western Connecticut State University partnered with Bethel and Danbury high schools to implement the "Building a Bridge to Improve Student Success" project. By *providing high school students with a better understanding of what is expected academically in college*, based on initial results on the Accuplacer placement test, and *creating relationships between writing and math faculty at the university and high schools so that the high school teachers were aware of college standards and expectations*, the need for remediation once these students entered college was decreased. Initial data are promising, with the percent of Bridge students that would need remediation in college writing decreasing from 61 percent (per junior year testing) to 6 percent (per senior year testing), and for math a decrease from 62 percent to 29 percent during the same time period. The Bridges program has since expanded to all four Connecticut State University System colleges, and similar programs are becoming available at the community colleges and their feeder high schools.

Administration of Accuplacer placement exam to high school juniors. While college faculty are limited in the number of high school faculty they can partner with, at least *giving the Accuplacer placement exam to high school juniors will alert students to areas of weakness, and provide an opportunity to better prepare for college level work*, with an Accuplacer retest in senior year to confirm preparedness. The use of the Accuplacer or comparable test should be made available to all high school students early in the junior year, so that remaining time in high school can be put to good use filling in skills/knowledge gaps and preparing for postsecondary education. Low-cost/no-cost options to fill in gaps include use of online resources such as KeyTrain or ALEKS (Assessment and Learning in Knowledge Spaces).

In Connecticut, Gateway Community College and many of the New Haven public high schools have partnered to conduct early testing of high school students and offer developmental courses to improve student academic performance prior to transitioning to college.

At the national level, at least two other states use the Accuplacer to test high school students early in the junior year. In response to concerns about the sizeable number of students unable to meet college-level reading and math requirements, for example, the Massachusetts Board of Higher Education recommended a pilot program offering the Accuplacer to 15,000 high school students during the junior year.[30] By making the assessment prior to college, 11th grade students are able to factor this information into decisions about how to prepare for college in the final years of high school.

[30] Massachusetts Board of Higher Education Early Assessment – Accuplacer, www.mass.edu.

Due to similar concerns about the lack of preparedness of entering college students, Minnesota began offering the Accuplacer to high school juniors approximately five years ago, assessing reading comprehension, written English, and intermediate algebra.[31] All juniors at North Community High School, for example, take the Accuplacer in mid-October each year, and seniors planning to attend the Minneapolis Community and Technical College retake the exam at the end of their senior year. High school juniors who attain college-ready scores are given the opportunity to attend the community college, beginning in the summer after their junior year. Approximately two-thirds of Minnesota's 24 two-year public colleges have Accuplacer testing programs with their area high schools.

The cost for taking the Accuplacer was estimated to be approximately $12 per student. Given the current cost of $354 for a three-credit remedial or developmental course for a student at a Connecticut community college, it would certainly be less costly, and increase postsecondary education success, for students to make the best use of their last high school years by preparing for college-level work. Given budgetary constraints, students could pay the minimal cost of the online Accuplacer test (currently, $1.75 per assessment unit). Therefore, the **program review committee recommends:**

> **All Connecticut high school juniors should be encouraged to take the Accuplacer or comparable test. Students may use their remaining time in high school to take additional preparatory coursework, utilize software programs such as KeyTrain, or a combination of these strategies to avoid remedial coursework in college.**

2) Barriers Related to Postsecondary Education Institutions

Some of the barriers to alignment include the multiple goals of colleges and their conflicting viewpoints on whether they are preparing generalists or specialists. Further, community college graduation rates continue to remain lower than expected, despite a sizable percent of students hoping to attain their associate's degrees.

Multiple goals of postsecondary education. One factor affecting workforce preparation by postsecondary education institutions is the multiple purposes served by colleges. Besides training recent high school graduates in occupations needed by Connecticut employers, community colleges, for example, provide support in skills upgrades for existing workers and offer noncredit courses for personal growth and of interest to the community.

Beyond offering courses toward degrees, public four-year colleges such as Central Connecticut State University make efforts to engage the community in initiatives such as "green" promotion within cities and helping to end homelessness. As part of its mission, the University of Connecticut has a goal to promote research, including stem cell research. Additionally, students are viewed as the customers of postsecondary education institutions, and many colleges

[31] Minnesota Tech Prep Annual Performance Report FY 2005.

see part of their jobs as helping students find a fit with what *they* want to do, rather than meeting employer needs.

One independent institution representative commented that education at her college is "…about more than employment at the completion of four years. Rather, it is the development of the person, the mind, and the heart. Career development is a part of that process but it is not a means to an end." The representative went on to note that focusing exclusively on post-graduation employment would alter what a degree from her college is all about. This point leads to another potential barrier in the alignment of postsecondary education: the lack of consensus on whether postsecondary education institutions should prepare graduates for particular occupations, or produce critical thinkers with the flexibility to meet general workforce needs.

Preparation of specialists vs. generalists by postsecondary education institutions. An argument has been made that today's college graduates will experience five or more careers during their working lives, and what they train for today, may not apply to what they are doing five to seven years after graduation. Therefore, rather than specialize in a particular field or occupation, colleges should provide students with the ability to "think" and problem-solve in a variety of contexts.

On the other hand, some businesses have very specific needs they want filled that require students to focus on particular areas. Licensed occupations, such as nursing and pharmacy, for example, require students to follow prescribed curricula that will prepare them to perform certain tasks. Engineers, while not required to be licensed, also must follow a given curriculum while training as college students.

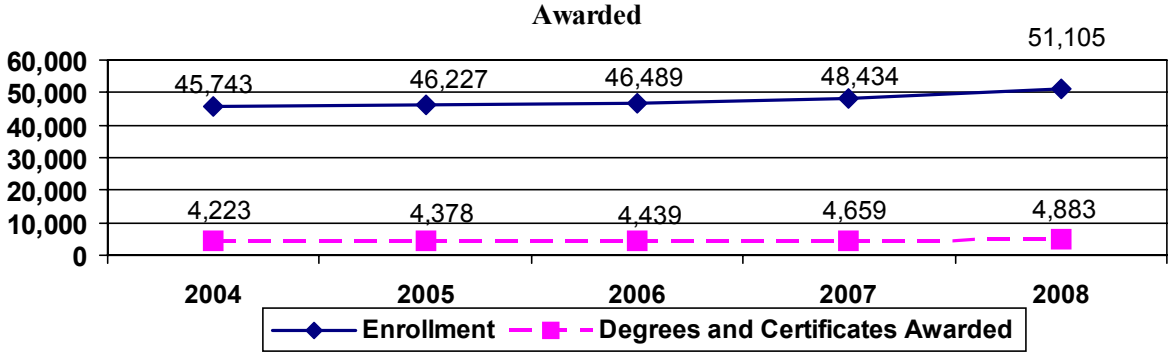
Some larger companies may be looking for generalist thinkers and problem-solvers, and then train new hires in-house for specific tasks. Indeed, employers themselves might not be unified in whether they need specialists or generalists to meet their needs. Regardless, another potential barrier related to postsecondary education institutions is the lower than expected number of students earning college degrees or certificates available to fill the skilled jobs of the 21st century.

Lower than expected production of postsecondary students earning certificates or associate's degrees. The federal government mandates that the college graduation rate be defined as the percentage of first-year, full-time degree seeking students in a cohort who complete within a given time frame (three years for community colleges and six years for four-year colleges). Any transfer students from two-year colleges into four-year colleges are therefore excluded from the graduation rate calculation. Despite these limitations, in general, Connecticut compares favorably in graduating students with bachelor's degrees, but poorly in graduating students with associate's degrees (as well as advanced degrees beyond the bachelor's degree).

Figure VI-5 shows the number of students enrolled in public two-year colleges and the number of degrees and certificates awarded. Despite the increase in enrollment, the annual completion rate for degrees and certificates continues to remain below 10 percent of all students enrolled in Connecticut community colleges. In a recently published book on college completion, the authors noted that policy makers need to pay more attention to graduation rates and to the

many kinds of waste that are involved when people begin but do not complete college.[32] Others have pointed out the community college emphasis on access rather than completion, and student lack of labor market and potential career ladder knowledge that would enforce the benefit of degree or certificate completion.[33]

Figure VI-5. CT Community College Enrollment and Degrees/Certificates Awarded



Source: DHE 2009 Report Higher Education Counts: Achieving Results.

In a national comparison, Connecticut — along with three other New England states — ranks in the bottom 20 percent in associate's degree completion rates (Table VI-6). The 16.1 percent Connecticut rate is well below the 27.9 percent national average. On a more positive note, Connecticut ranks in the top 20 percent of all states in bachelor's completion rate.

Table VI-6. Graduation Rates and Ranking for Degrees Conferred in 2007

State	3-Year Graduation Rates for Associate's Students		6-Year Graduation Rates for Bachelor's Students	
	Percent	Rank	Percent	Rank
Connecticut	**16.1%**	**43**	**63%**	**9**
Massachusetts	18.3%	41	68%	1
Rhode Island	14.5%	47	64.9%	4
Vermont	15.6%	44	63.7%	6
New Hampshire	31.7%	15	62.7%	11
Maine	28.9%	21	57.9%	19
National Average	27.9%	--	56.1%	--

Source: NCES, IPEDS Graduation Rate Survey

The lower associate's degree completion rate cannot be attributed to a smaller percentage of attendees having a goal of earning an associate's degree. The results of the "Entering Student Survey" administered each fall to new and transfer students attending Connecticut community

[32] Bowen, W. G., Chingos, M. M., & McPherson, M. S. *Crossing the Finish Line: Completing College at America's Public Universities*, Princeton University Press, 2009.
[33] Grubb, W. N. (1996). *Working in the Middle: Strengthening Education and Training for the Mid-Skilled Labor Force*, San Francisco: Jossey-Bass Publishers.

colleges further supports the notion that there is a lower than expected production of students earning associate's degrees at the community colleges (Table VI-7). In the fall 2008 survey of Connecticut community college students, over half (55 percent) reported a primary goal of obtaining an associate's degree. Obtaining a certificate is a goal for only a small portion of entering students (6 percent). Other goals included in the missing/other category were a desire to improve English proficiency skills and for job promotion purposes.

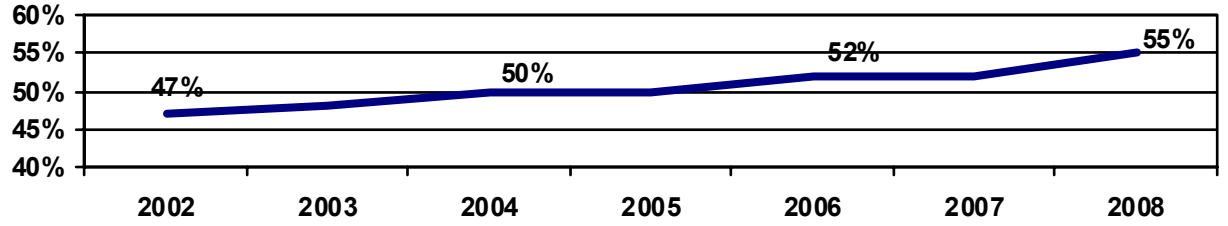
Table VI-7. Primary Goal for Attending a CT Community College as Reported on the 2008 Entering Student Survey

Primary Goal	Percent
Transfer with an associate's degree	28%
Associate's degree	27%
Fulfill another college's requirements	11%
Certificate	6%
Transfer without an associate's degree	6%
Job preparation/retraining course	4%
Unsure	5%
Personal development course(s)	2%
Missing/Other	11%

Source: *2008 Entering Student Survey*
http://www.commnet.edu/planning/Research/SurveysStudies/EnteringStudentSurvey/ess.html

The goal of obtaining an associate's degree has been steadily increasing over the past few years (Figure VI-6). The percent with a goal of obtaining a certificate, however, has remained relatively steady, fluctuating between six to seven percent of community college students.

Figure VI-6. Percent of Connecticut College Students with the Primary Goal of Obtaining an Associate Degree



Source: 2008 Connecticut Community College Entering Student Survey

In acknowledgment of Connecticut's lower associate's degree completion rate, Special Act 07-9 requires the Chancellor of the community colleges to develop a plan to increase Connecticut community college graduation rates. The plan recommends innovative educational strategies including expanded student support services, professional development for faculty, financial aid strategies, and transfer incentives, many of which will require additional funding.

Recommendations to Overcome Barriers Related to Postsecondary Education Institutions

Remedial coursework is one barrier to completing a degree or certificate, and recommendations to effectively address remediation are proposed along with several possible no-cost, low-cost strategies.

An annual 50-state progress report on the alignment of high school policies with the demands of college and work noted that postsecondary remediation offers a second chance for many students, but often is unable to make up entirely for the inadequate preparation in high school. They found three-quarters (76 percent) of students who require remediation in reading, and nearly two-thirds (63 percent) who require remedial math, do not earn degrees. On the other hand, the study authors reported nearly two-thirds (65 percent) of students who did not need remedial coursework completed an associate or bachelor's degree. Beyond the association between need for remedial coursework and less chance of degree completion, a recent Connecticut Supreme Court case brief argued that because of inadequate educational opportunities, many Connecticut public school students are leaving school without the necessary skills and knowledge required to successfully pursue higher education or advanced vocational training opportunities. It further pointed out the costs of maintaining subsequently necessary remedial programs at community colleges for these unprepared students are more than $12.5 million annually.[34]

Use of computer assisted tools for remedial coursework. A major study recently completed in Minnesota on the linkage of higher education with workforce and economic development identified several barriers to adult participation and completion in community college: prior preparation and an absence of basic skills as well as time, cost, and relevance. To address the lack of preparedness for college level coursework, the researchers recommended a greatly improved approach to remedial and developmental education. Specifically, they recommended:

- More "fine-grained" assessment of deficiencies
- Modularized instruction
- Use of technology
- A workplace-oriented approach (e.g., WorkKeys and KeyTrain)

The Connecticut Community College System has begun to use KeyTrain to assess and improve math and reading skills of students in the Bridges to Health Career Initiative, a grant awarded under the Community Based Job Training Grants, as implemented by the U.S. DOL, and discussed further in Chapter VIII of this report). KeyTrain is an internet-based, self-paced, interactive skills tutorial. Used in many community colleges throughout the country, Georgia, for example, is using KeyTrain to evaluate the preparedness of students to take a college placement test (such as Accuplacer). Students not achieving the required level use KeyTrain to build skills

[34] Supreme Court of the State of Connecticut S.C. 28032, *Connecticut Coalition for Justice in Education Funding, et al v. Governor M. Jodi Rell, et al. Brief of Amici Curiae* (The Workforce Alliance, The Workplace, Inc., The Bridgeport Regional Business Council, and the Connecticut Women's Education and Legal Fund), January 11, 2008

or brush up on rusty skills, and then take the college placement test. Colleges in more than 30 states are currently using KeyTrain; its popularity may be due to its consistency with the approach recommended by the Minnesota researchers of using a more fine-grained assessment of deficiencies, modularized instruction, use of technology, and a workplace-oriented approach when addressing remedial/developmental needs of students.

With a performance improvement goal (to be achieved by 2011) of 60 percent of developmental math students at community colleges passing the course, and currently less than half passing the course using the current traditionally taught remedial and developmental courses, a different approach needs to be considered. KeyTrain is available to all Connecticut community college students, but appears to be underutilized, perhaps because students and/or faculty are unfamiliar with the software program. **Therefore, the program review committee recommends that:**

> **Computer-assisted preparation programs such as KeyTrain should be promoted at all the community colleges. Results should be monitored for two years to determine whether use of the selected computer-assisted preparation program should be continued.**

Use of contextual learning for remedial courses. In addition to computer-assisted remediation, the literature suggests that contextual learning may be more effective than stand-alone remedial courses. According to one author, strengthening education and training for the mid-skilled labor force requires an integrated approach to providing remedial education. Rather than providing a freestanding class with little connection to the student's subject area of interest, experience- or work-based learning provides students with an understanding of how the remedial competencies are needed for future jobs.

Contextual learning for remediation is being used in some community colleges and secondary schools. Springfield Technical Community College (MA), for example, has developed a course called Introduction to Business, aimed at students contemplating a career in business but needing some remediation. The course itself uses a business text and covers some topics from standard business courses — business practices, business-related vocabulary and concepts, familiarity with different business careers — but uses a variety of materials, including computers, music, and video, for students whose reading levels are not yet adequate for more advanced courses such as accounting and management.[35]

Contextual learning has also been found successful, for example, in Asnuntuck Community College's Manufacturing Technology Center certificate and degree programs, where they apply theory to practice. Also, in Gateway Community College's Center for a Sustainable Future, math and English skills are taught in an embedded manner as part of the subject matter the students are learning about in the green field. Contextual learning is also an important element in Connecticut's technical high schools.

[35] *Working in the Middle: Strengthening Education and Training for the Mid-Skilled Labor Force*, by W. Norton Grubb, San Francisco: Jossey-Bass Publishers, 1996.

Contextual or embedded remedial material within an applicable setting of interest to the student may be more successful than a stand-alone remedial or developmental course, and also qualify the student for federal funding through a Pell Grant, a funding source which is not available for the noncredit, remedial courses. **Therefore, the program review committee recommends:**

> **The Connecticut Community College System should consider replacing stand-alone remedial courses with introductory credit courses that integrate remedial skills instruction.**

The successful use of contextual learning for remedial courses may have expanded application for education and training in green collar fields. Contextual learning may be particularly relevant for current members of the workforce taking courses or obtaining certificates to enhance skill sets with green knowledge and technology.

No-cost/low-cost degree or certificate completion recommendations. Aware of the challenges for students completing degree or certificate programs, the legislature passed Special Act 07-9. This act required the chancellor of the Connecticut Community College System to develop a plan to increase three-year graduation rates for the system's institutions from 10-11 percent to the national norm for peer community colleges, which is currently 15 percent. The resulting improvement plan included a variety of efforts. One key strategy was adding full-time faculty and student services personnel to allow for such initiatives as expanded services in academic skills centers, crisis counselors, and retention specialists. There is evidence that these strategies would lead to improved retention and graduation rates; however, with the current economic challenges, the required funding for these initiatives is often unavailable. Given that the failure of students to complete degrees or certificates presents a barrier to preparing the well-educated workforce needed for the 21st century, other no- or low-cost strategies should be implemented.

One strategy where research has shown effectiveness is an *early warning system*, where instructors monitor student academic success and intervene early when students appear to be struggling. New York's Hudson Valley Community College has adopted an early warning system in recognition that it increases the college's ability to offer the student access to needed support. An instructor who is concerned about a student's academic progress issues an alert letter in the third week of the semester, requesting that the student schedule an appointment to discuss issues and "move forward with a plan for the successful completion of the semester."[36] The University of Connecticut also uses an early warning system as one of several programs that are intended to foster student success. In the first six weeks of freshmen year, if a student receives a D or an F on a test, the student will be counseled one-on-one to go for extra help or receive some other needed intervention. The university noted that it is not uncommon for students to have such experiences, with about 20 percent of students getting a D or F in one or more courses in their first six weeks of college.

[36] Hudson Valley Community College Early Warning System Alert Letters, Fall 2009 (https://www.hvcc.edu/issr/ews.html).

A second strategy (mentioned earlier) that is beneficial for remediation is *use of KeyTrain or other software to help students prepare for college level coursework*. Research has shown the strong relationship between need for remediation and poor success in degree completion. However, a Massachusetts task force on retention and completion rates at Massachusetts community colleges found that early completion of developmental coursework positively influences retention and graduation rates. Students who completed developmental coursework in their first semester had a three-year graduation rate of 19.1 percent compared with just a 3.8 percent graduation rate for students who did not complete the developmental coursework in the initial semester.[37]

A third strategy to consider is the *use of peer tutors*, perhaps supplied in part through work-study assignment of students who excel in the particular subject area.

Budgetary constraints are projected to continue into the near future. Therefore, community colleges and other Connecticut colleges faced with lower than desired graduation rates, should pilot and expand no- or low-cost initiatives, such as the ones described in this chapter, wherever possible to improve intention and completion rates. Therefore, the **program review committee recommends:**

> **Connecticut colleges should implement no- or low-cost initiatives to improve graduation rates. Success or failure of efforts should be shared with all colleges on the DHE website.**

These no- or low-cost initiatives can be used to promote successful completion of newly developed certificates in green and other emerging fields. By incorporating strategies such as early warning systems, use of KeyTrain or other software to help students prepare for college level coursework, and/or peer tutors, the outcomes for students in green certificate programs can be strengthened.

Day care. As noted earlier, higher education is increasingly being asked to provide non-academic support services to students, particularly within the community college system. However, the focus of postsecondary institutions has been on educating students and providing academic supports where needed. Evidence suggests that students, particularly at the community college level, have more social service needs, because they are often older, part-time, and commuters, and have additional work and family responsibilities. Recently, in a September 2009 publication by the Connecticut Association for Human Services (Connecticut's Challenge: Preparing Our Workforce… Strengthening our Community Colleges) noted, "once a working adult student enters college, the ability to complete an Associate's or a Bachelor's degree depends on a variety of factors. Income and college preparation are the most influential, but access to financial aid, child care and transportation assistance, and academic and personal counseling also impact student longevity."[38]

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[37] Massachusetts Board of Higher Education *Final Report from the Task Force on Retention and Completion Rates at the Community Colleges*, February 2007.

[38] Roberts, B. and Povich, D. (2006). *Promoting Student Success in Community Colleges by Increasing Support Services.* Washington, DC: Working Poor Families Project, Policy Brief. Fall 2006.

Some individuals interviewed by committee staff indicated that there needs to be a shift in the types of supports the state is willing to provide to students to help them stay in college. Evidence suggests that students, particularly at the community college level, have more social service needs, because they are often older, part-time, commuters, and have additional work and family responsibilities. For example, the availability of day care could have a major effect on retention rates.

In recognition of one of these needs, all twelve community colleges have child care services (see Appendix F for details). There may be capacity concerns, in that as of November 2009, eight of the 12 colleges had waiting lists, ranging from a low of two children at one college to a high of 129 children at another. In total there were 374 children on the wait lists, although it is unknown whether they were children of students, faculty members, or individuals residing in the community. Other features of the child care services are:

- six of the colleges offer day care during the summer sessions, while six do not;
- the majority accept children age 3 or 4 years old, while only two serve infants;
- few have early evening hours; and
- the fees charged range from free to $28 for a full day (half time is also available).

3) Difficulty in Making Accurate Demand Projections

Limited information is available on the accuracy of the DOL job demand projections. Connecticut DOL staff reported that they do not look back to determine whether previous projections made for future years were accurate in terms of the number of job openings that were available when that year arrived.

As part of this study, PRI staff assessed the accuracy of projections made in 1998 for the year 2008. Data were available from both the U.S. Bureau of Labor Statistics and Connecticut Department of Labor websites. Table VI-8 shows the accuracy of projections for occupational employment in Connecticut ranged from a less than one percent difference between actual and projected figures (e.g., pharmacists) to a difference of 50 percent or more (e.g., pharmacy technicians). Figure VI-7 shows that Connecticut projections were within 10 percent of actual estimates about one-third of the time (36 percent), similar to the accuracy of national projections.

In its analysis, PRI staff found instances where the DOL projected number was greater than the actual number employed in a particular occupation. This may indicate that either DOL overestimated the number of workers that would be needed in that occupation or there is a shortage of workers in that particular field.

In general, the ability to forecast 10 years out the types of jobs that will be available in the future is limited. For example, Connecticut's economy was projected to generate over 171,000 new jobs during the 1998-2008 period, for an estimated 1.9 million employment total in 2008.[39] The U.S. Bureau of Labor Statistics, however, estimated the actual number of jobs in Connecticut in May 2008 to be 68,696 fewer compared with 1998 (1.7 million). Projections shorter than ten years away, however, may be more accurate.

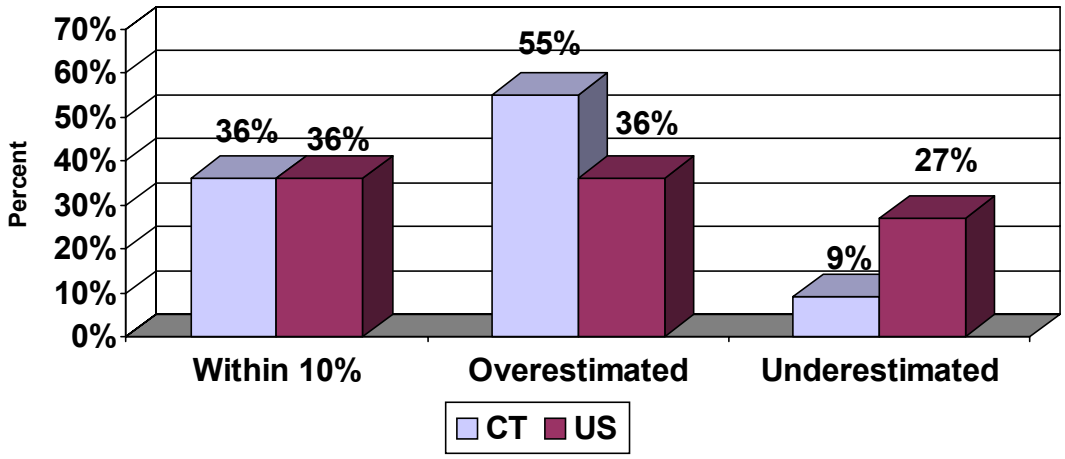
[39] *Soaring to New Heights: Connecticut Job Outlook* 1998-2008, CT DOL.

Table VI-8. Accuracy of CT and US DOL Occupational Employment Projections 10 Years Out						
	# of Connecticut Employees in 2008			# of U.S. Employees in 2008 (in thousands)		
Occupation	**As projected in 1998**	**Actual # in 2008[a]**	**Accuracy**	**As projected in 1998**	**Actual # in 2008**	**Accuracy**
Pharmacists	2,786	2,750	↓1%	199	266	↑34%
Registered Nurses	34,502	35,370	↑2%	2,530	2,543	□1%
Civil Engineers	3,156	3,040	↓4%	236	261	↑11%
Accountants and Auditors	19,325	17,330	↓10%	1,202	1,134	↓6%
Securities, Commodities, Financial Services Sales Agents	8,114	6,780	↓16%	427	272	↓36%
Licensed Practical and Vocational Nurses	9,601	7,940	↓17%	828	730	↓12%
Librarians	3,088	2,490	↓19%	159	151	↓5%
Actuaries	1,043	820	↓21%	17	18	↑6%
Automotive Service Technicians and Mechanics	12,270	8,160	↓33%	922	649	↓30%
Lawyers	14,500	8,090	↓44%	798	554	↓30%
Pharmacy Technicians	2,063	3,230	↑57%	126	324	↑157%

[a]The actual number employed does not take into account vacancies. A 2004 survey of CT employers (*Connecticut Job Vacancy Survey*, Spring 2005, CT DOL) highlighted a sizeable number of shortages for registered nurses (1,677), accountants and auditors (809), secondary school teachers (319), and licensed practical and vocational nurses (305).

Source: Connecticut Occupational Employment Projections, 1998-2008 (CT DOL); and May 2008 State Occupational Employment and Wage Estimates for Connecticut (U.S. Bureau of Labor Statistics)

Figure VI-7. Accuracy of Occupational Employment Projections



Source: PRI staff analysis

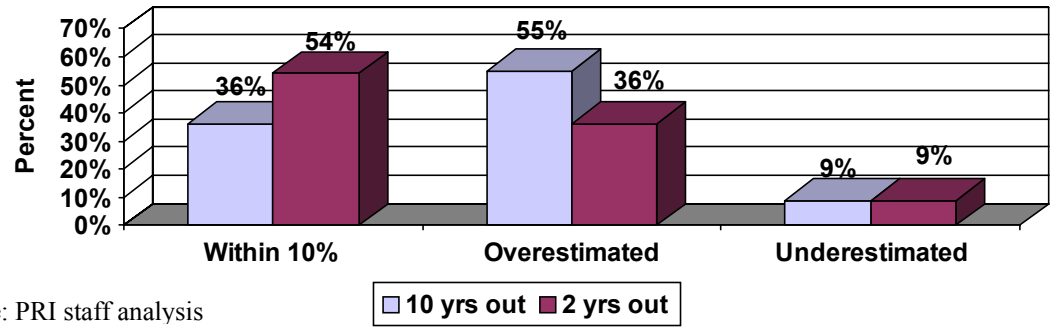
Short-range projections. There are shorter range occupational employment projections made by Connecticut DOL that are more accurate and may be more useful (Table VI-9), especially if the state were to adopt a policy of implementing short-term postsecondary education programs to quickly provide students with skills needed by employers. Projections two years into the future, for example, were accurate to within 10 percent approximately half the time (Figure VI-8). There are other challenges in predicting future employer needs such as changes to the projection methodology.

Table VI-9. Accuracy of CT DOL Occupational Employment Projections Two Years Out for 2007

Occupation	As projected in 2005	Actual # in 2007	Accuracy
Pharmacists	2,940	2,820	↓4%
Registered Nurse	33,550	34,690	↑3%
Civil Engineers	3,060	3,250	↑6%
Accountants and Auditors	21,290	18,490	↓15%
Securities, Commodities, Financial Services Sales Agents	7,810	6,390	↓22%
Licensed Practical and Vocational Nurses	7,540	7,930	↑5%
Librarians	2,500	2,490	□1%
Actuaries	900	880	↓2%
Automotive Service Technicians and Mechanics	10,850	8,300	↓31%
Lawyers	10,890	7,730	↓41%
Pharmacy Technicians	2,720	3,120	↑13%

Source: Connecticut's Industries and Occupations Forecast 2007, published January 2005 (CT DOL); and May 2007 State Occupational Employment and Wage Estimates for Connecticut (U.S. Bureau of Labor Statistics)

Figure VI-8. Accuracy of Occupational Employment Projections



Source: PRI staff analysis

Changing methodology. One challenge in projecting future employer needs is that the methodology required for such calculations has been modified by the U.S. government several times. One change was in the occupational classification system where, prior to 1999, for example, there was just one category for "computer programmers." In 1999, a change was made to include several computer-related occupations, such as systems software engineers and application software engineers, which may have been reported as computer programmers in the past.

In 2002, another change was made, this time in the survey reference period. Instead of October, November and December, employers were asked about May and November in an effort to reduce seasonal influences. The federal government is considering additional changes to the methodology that would make the data more suitable to comparisons over time; however, the U.S. Bureau of Labor Statistics reported on their website that such changes are still in the early stages of discussion (as of December 2009). Beyond the changes in methodology made by the federal government, there are others projecting employer needs.

Multiple sources for projections. Another challenge is that there are multiple sources for projections of future employer needs. Beyond the official Connecticut Department of Labor projections, other state agencies such as the Office of Workforce Competitiveness and Department of Economic and Community Development also produce reports suggesting where future job growth in Connecticut may lie.

More local projections are made by businesses via advisory committees affiliated with public colleges and universities. As described in Chapter II, statewide associations such as the Connecticut Business and Industry Association and the Connecticut Hospital Association also develop projections based on membership surveys of workforce needs, underscoring the different methodologies used to project future employer needs.

Different methodologies. Also challenging are the multiple methodologies for determining which occupations are in greatest demand. The Connecticut DOL Labor Market Information website has different views for looking at occupations in demand including: fastest growing (based on percent increase from two time periods); largest job growth; and most openings. For example, Table VI-10 shows the 10 occupations requiring postsecondary education with the highest growth rate. As the table shows, the projected number of annual openings can be as few as 16 openings annually (for Airline Pilots, Copilots, and Flight Engineers). Regardless of methodology used, another issue is lack of awareness of the projections.

Table VI-10. Occupations Requiring Postsecondary Education Having the Highest Growth Rate in Connecticut: 2006-2016

Occupation	Growth Rate	Annual Openings
Commercial Pilots	50.6%	20
Network Systems and Data Communications Analysts	43.7%	200
Veterinary Technologists and Technicians	41.3%	75
Airline Pilots, Copilots, and Flight Engineers	40.6%	16
Computer Software Engineers, Applications	36.4%	356
Substance Abuse and Behavioral Disorder Counselors	35.5%	67
Radiation Therapists	33.0%	38
Veterinarians	31.2%	54
Mental Health Counselors	29.0%	98
Financial Analysts	28.1%	218

Source: Labor Market Information from the Office of Research, CT DOL, *Top Occupations Requiring Postsecondary Education by Growth Rate* (2006-2016)

Lack of awareness of projections. Beyond the challenges associated with the projections themselves, there may also be a lack of awareness of these projections. Overall, the Connecticut DOL makes projections, other career-related information, and planning tools available on their web site, but does not proactively notify other state agencies, colleges or members of the public. The Connecticut DOL does periodic mass mailings of certain publications, such as *Connecticut Career Paths* and the *Connecticut Career Resource Network Update*, which are delivered to more than 2,000 high school teachers, counselors, and administrators in the state. The publication contains information about various occupations, job outlooks, wages, education and training routes, and employment and other preparatory resources available.

There is also a wealth of information contained on the Connecticut DOL website; however, it requires initiative and awareness that such information exists in order to seek it out. The *Soaring to New Heights* report, for example, is available on the Connecticut DOL website and provides a useful snapshot of jobs currently in greatest demand by training level. The publication was recently reduced from six to four pages to save paper, and therefore, money; in doing so, however, information on teacher occupations in demand was eliminated.

There were instances where State Department of Education (SDE) staff reported they were unaware of the occupational projections pertaining to teacher openings made by DOL, and there was no consistent use of this information by the colleges and universities in guiding students. Awareness of the projections, however, does not necessarily lead to *use* of the projections in decision making by college administrators, faculty and students.

Responsiveness to projections. While some may be aware of the occupational projections made by Connecticut DOL, it is unclear how that information is factored into subsequent decision making, by both postsecondary institutions and students. At best, the projections may be one small piece of data considered by the institution when determining which program degrees and certificates to offer.

Recommendations to Overcome Barriers Related to Workforce Demand Projections

Accuracy of projections. The 10-year projections are based on long-term trends such as labor force growth rate and population age, and do not take into account changes due to new technologies, medical breakthroughs, disasters, etc. Shorter-term occupational projections, such as two years out, have their own drawbacks, particularly greater susceptibility to economic cycles. Instead of gathering information from employer surveys, the Connecticut DOL and neighboring states are exploring the use of job vacancy rate data for making short-term projections of near future job demand. With recently approved federal grant funding,[40] information on current and near future green job opening projections may be developed using sophisticated automated systems and analyses of electronic job postings. The PRI committee supports this initiative to improve the accuracy of shorter-term occupational projections, and the **program review committee recommends that:**

[40] Northeast Research Consortium *Making 'Green' Real Grant*, U.S Department of Labor, Approved: (12/1/09-5/31/11).

The State Department of Labor should continue to pursue development and use of an electronic job vacancy methodology to provide current and near-future information on job demand in Connecticut.

As will be described in Chapter VII of this report, estimates of the size of the green collar workforce vary dramatically, ranging from 5,493 to more than 22,000 individuals, due in part to current lack of agreement on the definition of green collar jobs. The job vacancy information to be compiled by the Northeast Research Consortium with funding from the recently awarded ARRA grant will be useful to the unemployed, underemployed, and high school students considering green collar careers.

Teacher shortage areas. Currently, a letter from the commissioner of education to all superintendents of schools is sent each spring, listing the certification endorsements that have been designated by SDE as teacher shortage areas for the upcoming school year. The legislature adopted a program in July 1, 2000 (P.A. 00-187) that created a state mortgage assistance program for certified public school teachers who: 1) teach in one of the shortage areas; 2) are employed by a priority or transitional school district; or 3) are employed by a technical high school located in a priority or transitional school district.

While teacher shortage information is known to school districts, there is no similar letter sent to Connecticut public and independent colleges with teacher preparatory programs. Greater distribution of this information is consistent with a strategy published by SDE a decade ago,[41] to "widely disseminate information on expected shortage and non-shortage assignment areas using a variety of distribution media (web pages, bulletins, and advertisements)." By notifying faculty and career counselors who advise and interact with students on a regular basis, there is a greater likelihood that information about shortage areas (i.e., high demand teaching areas) will become known to students considering careers in teaching.

Additionally, SDE is required to identify teacher shortage areas on an annual basis for the federal loan deferment/repayment programs that are available for teachers of subject shortage areas. However, since teacher preparation requires four years, it is unrealistic to assume that information on incentives that are available for a single year will influence teaching areas that students might spend the next few years training in.

The PRI committee found that similar shortage areas are identified from year to year by SDE, and information on teacher shortage areas for the past five years would provide more practical information to students on where anticipated teacher shortage areas are expected at a point when the student will be ready to enter the workforce. Therefore, the **program review committee recommends that:**

The State Department of Education should annually compile and electronically distribute to all Connecticut public and independent colleges with teacher preparatory programs information for at least the past five years on teacher shortage areas.

[41] *Public School Educator Supply and Demand in Connecticut: A Look Toward the 21st Century*, State of Connecticut Department of Education, 1999.

Awareness of job demand projections. Changing to an electronic distribution of the *Soaring to New Heights* report would potentially expose many more high school and college teachers, counselors, and administrators to job demand information that could then be shared with students making decisions about their future careers. The recent cost-saving measure of report size reduction would not be a factor for an electronically mailed document. Also, transitioning to electronic mailing of *Soaring to New Heights* is consistent with current consideration by Connecticut DOL staff to electronically mail some of their publications. Therefore, the **program review committee recommends that:**

> **The State Department of Labor should electronically mail the "Soaring to New Heights" report to all state high schools and colleges, returning to the earlier format that includes information on teacher occupations in demand.**

Responsiveness to projections. Beyond providing existing publications — such as Connecticut Career Paths, and Connecticut Career Resource Network Update to high schools and colleges — it is unclear how useful this information is to the educational institutions and colleges. There may be additional or different information that would be more helpful to students in making career decisions. There may be another format in which the existing report information would be more accessible to the high school and college teachers, advisors, and students.

The Connecticut DOL has previously surveyed some of its customer audiences; however, *Connecticut DOL staff could not recall having previously surveyed high school guidance counselors and college admission officers/career counselors to see what information would be most useful to them*. Therefore, to promote the use and usefulness of Connecticut DOL publications by high schools and colleges, the **program review committee recommends that:**

> **The State Department of Labor should survey high school guidance counselors, college admission officers, and college career counselors to determine what information and in what format would be most helpful to students in making career decisions.**

4) Current Economic Challenges

A significant factor impacting the jobs projections both at the state and national level are current economic conditions, such as the recent recession. The Connecticut DOL reported a 3.4 percent decline in nonfarm employment between March 2008 and March 2009.[42] During the same period, there was an unemployment increase to 7.5 percent, a level not experienced since May 1992. Employment in nearly all industry sectors in Connecticut declined from July 2008 to July 2009, especially for construction (-22 percent), manufacturing (-8 percent), and professional and business services (-8 percent). This shrinkage in job supply was not foreseen when the most recent 10-year employment demand projections were made.

[42] September 2009 *Connecticut Economic Digest*, Vol. 14, No. 9, A joint publication of the CT DOL and the CT Department of Economic and Community Development.

The current economic challenges may also be impacting the decisions of high school students to attend college in-state or out-of-state, and to begin postsecondary education at the less-expensive community college versus the four-year state university. The state retirement incentive program may also impact the turnover in faculty at technical high schools, community colleges, state colleges and the University of Connecticut. On the other hand, there are federal initiatives that may come to fruition, promoting attendance at community colleges.

In addition to federal initiatives, questions have been raised as to whether Connecticut is experiencing a "brain drain." A review of migratory patterns of college-educated residents sheds light on whether Connecticut is losing its educated workforce.

Review of Migratory Patterns of College-Educated Residents

A recent study on preparing a quality workforce[43] described the issue of "brain-drain," the loss of many of the best and brightest Connecticut high school students (as measured by performance on the 10th grade CAPT test) to the state's future labor market. One cause of brain-drain is attendance at an out-of-state college. As evidence of the brain-drain, the report found that in 2002, for example, nearly half (48 percent) of the best and brightest Connecticut students began their freshmen years in out-of-state colleges, and only 20 percent of those students returned to work in Connecticut following graduation. There is also a more general concern that too many of Connecticut's students are heading out of state to attend college.

However, Table VI-11 shows that, overall, there has been a slight increase during the past decade of students choosing to remain in Connecticut for their education at a four-year college. Of the other New England states, Rhode Island and Maine also showed an increase in percent of freshmen attending college in-state. The New England figures, however, contrast markedly with the national statistics, showing 74-75 percent of freshmen enrolling in-state during 1996 and 2006.

Table VI-11. Percent of State's Freshmen Attending Four-Year College In-State

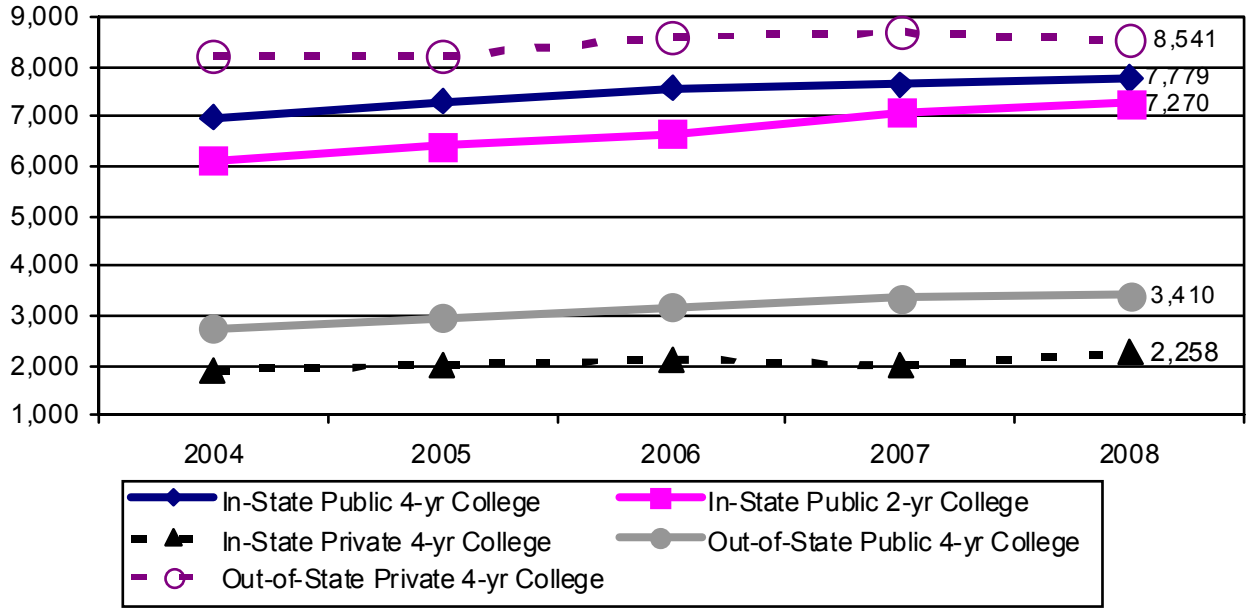
State	Number/Percent of State's Freshmen Attending In-State College			
	Fall 1996		Fall 2006	
	Number	Percent	Number	Percent
Connecticut	**6,623**	**39.6%**	**9,453**	**41.2%**
Vermont	1,461	47.2%	1,654	41.8%
New Hampshire	2,527	44.7%	3,316	41.8%
Rhode Island	2,160	48.5%	2,973	54.2%
Maine	3,288	51.1%	4,506	57.9%
Massachusetts	19,542	62.0%	23,915	58.8%

Source: *The Condition of Education 2008: Indicator 10 Mobility of College Students* (U.S. Department of Education Institute of Education Sciences)

[43] *Next Steps: Preparing a Quality Workforce*, by Stephen Coelen, Sevinc Rende, and Doug Fulton, Department of Economics and CT Center for Economic Analysis, University of Connecticut, April 2008.

Increasing percent of Connecticut residents attending college in-state. More recent figures on where Connecticut high school graduates attend college show an even greater percent choosing to attend college in-state (Figure VI-9). In PRI staff interviews held with Connecticut community college and state university personnel, applications had reportedly soared for the 2009-2010 academic year, and increases in enrollment were anticipated.

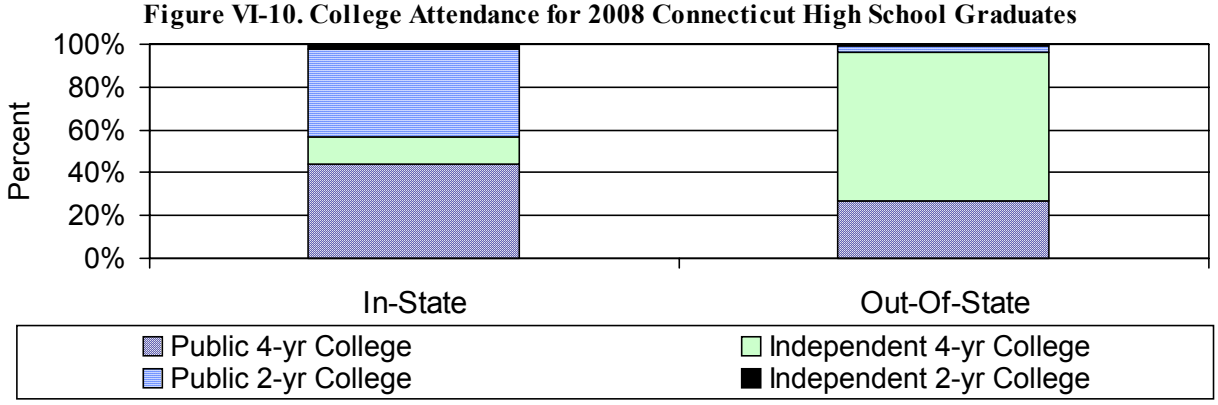
Figure VI-9. Where CT Grads are Attending College



Source: Connecticut State Department of Education www.csde.state.ct.us/public/cedar/cedar/grads/index.html

Figure VI-10 shows the majority of 2008 Connecticut high school graduates planning to attend college *in-state* choose *public* colleges, while the majority planning to attend college *out-of-state* select *independent* colleges.

Figure VI-10. College Attendance for 2008 Connecticut High School Graduates



Source: Connecticut State Department of Education www.csde.state.ct.us/public/cedar/cedar/grads/index.html

Migration of citizens with some college or associate's degrees into and out of Connecticut. Overall, the six New England states averaged a very slight annual loss (-0.20 percent) in the number of residents with some college or an associate's degree. This slight loss was driven primarily by Massachusetts and Connecticut, because they are the most populous New England states. Table VI-12 shows the number of persons with some college or associate's degree who migrated into and out of Connecticut and the other New England states.

Table VI-12. Migration for Persons with Some College or Associate's Degree				
State	**Residents 25 years and over with Some College or Assoc. Degree**			
	Migrating Into State	**Migrating Out of State**	**% Change (net migration)**	**Total Residents with some college or Assoc. degree**
Rhode Island	3,658	5,034	-0.81%	170,528 (24.0%)
Massachusetts	16,617	21,286	-0.47%	998,320 (22.9%)
Connecticut	**12,178**	**13,062**	**-0.16%**	**562,383 (23.9%)**
Vermont	3,374	3,142	0.22%	104,438 (24.6%)
New Hampshire	7,797	7,246	0.23%	241,920 (27.2%)
Maine	7,026	5,661	0.56%	243,585 (26.5%)
Source: U.S. Census Bureau 2005-2007 American Community Survey 3-Year Estimates				

Migration of bachelor-degreed persons into and out of Connecticut. Combined, the six New England states netted a slight annual increase (+0.29 percent) in the number of people with at least bachelor's degrees moving into the state than leaving the state. As shown earlier in Chapter I (Table I-2), Connecticut ranks fifth in percent of heads of households with at least four years of college (2005-2007).

The U.S. Census also collects information on annual net migration rates for each state, including the proportion with at least four years of college. Table VI-13 shows the number of persons with at least a bachelor's degree who migrated into and out of Connecticut and the other New England states. Given more people with bachelor degrees are moving into Connecticut than out of Connecticut, and increasingly more Connecticut high school graduates are choosing to attend college in-state, there is a question about the extent of a "brain-drain" in Connecticut.

Table VI-13. Migration for Persons with at Least Bachelor's Degrees				
State	**Residents 25 years and over with at Least Bachelor's Degrees**			
	Migrating Into State	**Migrating Out of State**	**% Change (net migration)**	**Total Residents with at Least Bachelor's Degree**
Massachusetts	56,276	55,007	0.08%	1,614,605 (37.0%)
Rhode Island	9,187	8,661	0.25%	209,264 (29.4%)
Connecticut	**29,877**	**26,904**	**0.37%**	**804,909 (34.3%)**
New Hampshire	12,902	11,468	0.51%	282,433 (31.8%)
Vermont	7,253	6,358	0.64%	139,002 (32.7%)
Maine	9,878	7,495	1.0%	237,934 (25.9%)
Source: U.S. Census Bureau 2005-2007 American Community Survey 3-Year Estimates				

5) Barriers Related to State Agency Organization, Programs, and Policies

There is a strong link between the supply of an educated workforce and a state's competitiveness in an increasingly global economy. Thus, one facet of Connecticut's economic standing is the ability of its colleges and universities to produce graduates with the skills needed by Connecticut's employers. In addition, an available and educated workforce is a major resource in attracting new businesses to the state.

Connecticut's higher education organizational structure, policies it promotes, and programs it funds can impact the alignment of postsecondary education and the workforce needed by Connecticut's businesses and industries. The types of programs and policies that influence alignment include state-funded strategies to ensure high school students are college-ready, providing academic and non-academic supports to students to improve retention and graduation rates, and offering scholarships that encourage students to enter careers in critical worker shortage areas. Other factors that affect alignment are the state's organizational structure for its higher education system, where program funding decisions are made, and ultimately how those decisions are integrated with the priorities of state agencies responsible for workforce and economic development.

As discussed in Chapter IV, *Connecticut's system for public higher education is very decentralized*. Consequently, decisions are often made from the bottom-up – at the individual college or constituent unit level – rather than in a centralized manner that makes strategies uniform across all colleges. An example of this is in a college's decision to offer a new for-credit academic program of study. Although a new program must ultimately be approved by the Board of Governors of Higher Education, it is the college that brings the idea forward, rather than BGHE suggesting what programs should be offered by which colleges or in what geographic locations.

A second potential organizational barrier is that separate boards of trustees (for UConn, CSUs, CCs, and Charter Oak) rather than BGHE make budgetary allocation decisions once funds have been appropriated by the legislature. This gives those boards of trustees ultimate authority over a wide range of decisions. Thus, BGHE has little real authority so its primary focus is on providing coordination and assistance to the constituent units when requested.

Also, colleges are funded according to formulas that include enrollment figures, revenues received, and operating expenses, rather than by outcomes, such as degree and certification completion rates. With little budgetary focus on outcomes, colleges have no financial incentive to focus on improving completion rates. Further, a policy of adding or dropping college programs based on enrollment figures rather than employer needs, makes the alignment of postsecondary education and employer needs challenging.

A fourth potential barrier is the high level of coordination needed across the multiple boards and state agencies that have a variety of responsibilities. In order to create a talent pipeline – as endorsed by the governor, CETC, and OWC – inadequate student performance needs to be addressed at a much younger age, before students actually enroll in college because college graduation rates for students who need remedial postsecondary education are poor.

Therefore, there needs to be a high level of coordination across agencies, commissions, and boards. The P-20 Commission was constituted to address this and other issues, but it unclear whether this commission will be successful. In a survey given to P-20 Commission members in April, 2009, members were asked to rank the "current level of trust" among the various groups represented on the commission on a scale of 1 to 10. Survey results show that members gave the current level of trust a ranking of "5," with a 9.4 ranking of how important it is to have trust.

A fifth potential barrier is the lack of program funding for state agency initiatives to help align postsecondary education and employment. Chapters IV and V presented information on statutory programs that sought to address workforce shortages by providing loan incentives or containing loan forgiveness provisions. As the chapters describe, many of these programs were "within available appropriation," or pilot programs that never were institutionalized so that funding was discontinued, even if they had been successful.

Recommendations to Overcome Barriers Related to State Agency Organization, Programs, and Policies

Since the purpose of this study was not to reorganize the higher education system, the committee made several recommendations within the existing structure focused on the issue of the education role in developing the workforce and supporting the state's economy. Recommendations are aimed at strengthening the coordinating and policy-making role of the Board of Governors of Higher Education by requiring it to:

- develop a master strategic plan that links together the roles of the separate constituent units and includes how the higher education system relates to the P-12 system and workforce needs of the state;
- develop strategies in the plan, along with the four constituent units, to implement if colleges and universities fail to make progress on the specific accountability measures already being reported on; and
- examine whether academic programs or career pathways need to be established in order to meet the workforce needs of competitive sector-based employers in Connecticut, based on information developed by the Office of Workforce Competitiveness.

Public Higher Education and Strategic Planning

Many efforts have been made through statute to develop a systemwide plan based on overarching goals for Connecticut's post-secondary education system. These include:

- Board of Governors for Higher Education Master Plan (1982);
- Accountability Report (1999); and
- Blue Ribbon Task Force Strategic Plan (2007).

The authorizing statute for each of these efforts sets out core goals to be achieved by the higher education system, and each includes at least one goal directly related to the state's economic development needs (see Table VI-14). However, the BGHE master plan has never been developed and the blue ribbon task force established in 2007 to create a strategic plan has yet to be appointed. The accountability report, though, has been developed and produced each year. It contains performance measures and data analysis that describes public college and university progress towards meeting the statutorily-defined goals.

Table VI-14. Comparison of Statutorily-Required Higher Education Goals to be Promoted

BGHE Master Plan to be Consistent with Following Goals (C.G.S. Sec. 10a-b(b)	Goals to be Measured in Accountability Report (C.G.S. Sec. 10a-6b)	Blue Ribbon Task Force Strategic Master Plan Promoting these Overall Goals (C.G.S. Sec. 10a-11b(3)(b)
Ensure that no qualified person be denied the opportunity for higher education on the basis of age, sex, ethnic background or social, physical or economic condition	Enhancing student learning and promoting academic excellence	Ensure equal access and opportunity to post-secondary education for all state residents
To protect academic freedom	Joining with elementary and secondary schools to improve teaching and learning at all levels	Promote student achievement, including student performance, retention and graduation
Provide opportunities for education and training related to the economic, cultural and educational development of the state	Ensuring access and affordability of higher education	**Promote economic competitiveness in the state**
Assure the fullest possible use of available resources in public and private institutions of higher education	**Promoting the economic development of the state to help business and industry sustain strong economic growth**	Improve access to higher education for minorities and nontraditional students, including, but not limited to part-time students, incumbent workers, adult learners, former inmates and immigrants
Maintain standards of quality ensuring a position of national leadership for state institutions of higher education	Responding to the needs and problems of society	Ensure the state's obligation to provide adequate funding for higher education
Apply the resources of higher education to the problems of society	Ensuring the efficient use of resources	
Foster flexibility in the policies and institutions of higher education to enable the system to respond to changes in the economy, society, technology and student interest.		

The Board of Governors for Higher Education and strategic planning. The Board of Governors for Higher Education is the central policy-making authority for public higher education in Connecticut. It is intended to serve as a coordinating body for all of the public and independent colleges, universities, and postsecondary institutions in the state. As noted previously, Connecticut's public higher education is decentralized and each of the constituent units has a high degree of independence to meet the varied needs of its students. Even within the Connecticut Community College and Connecticut State University Systems, the individual colleges and universities have specific individual missions. While this has often produced excellent initiatives that link academic programming to employer need at the regional level, these efforts are rarely consistent or institutionalized at the state level and, therefore, may be creating unnecessary inefficiencies and redundancies.

Under C.G.S. Sec. 10a-6(b), the Board of Governors for Higher Education is statutorily required to develop a master plan for higher education consistent with seven statutory goals (shown in the left column of Table VI-14). However, the *program review committee found that no current plan exists and DHE staff could not recall when the last plan was developed.*.

Blue Ribbon Task Force and strategic planning. The legislature recognized the lack of a master plan and the importance of establishing one for Connecticut's postsecondary system when it created a Blue Ribbon Task Force in 2007, charged with developing and implementing a strategic master plan by October 1, 2008. The legislation listed five goals that the plan was to promote (in the right column of Table VI-14), some of which are similar to the goals required to be addressed by the BGHE master plan.

The legislation establishing the task force identifies nine major issues facing the higher education system and permitted the task force to consider:

- establishing incentives for institutional performance and productivity;
- increasing financial aid programs, particularly in workforce shortage areas and for minority students;
- implementing mandatory college preparatory curricula in high school and aligning it with curricula in institutions of higher education;
- seeking partnerships with the business community and public institutions of higher education to serve the needs of workforce retraining including the establishment of bridge programs to meet demand in workforce shortage areas;
- establishing collaborative partnerships between public high schools and institutions of higher education;
- implementing programs in high school to assist high school students seeking a college track or alternative pathways;
- developing policies to promote and measure retention and graduation rates of students;
- addressing the education needs of minority and nontraditional students; and

- addressing the affordability of tuition at institutions of higher education.

Relevant to the PRI study, the task force is required to:

- examine the impact of demographics and workforce trends on higher education in the state;
- address the challenges related to increasing the number of students earning bachelor's degrees in the state, increasing the number of young people entering the state's workforce, and eliminating the disparity in the achievement gap between minority students and others;
- recommend ways in which the state's higher education institutions can, consistent with their respective missions, expand their role in advancing the state's economic growth; and
- review the higher education board of governors' master plan for higher education and strategic plan for racial and ethnic diversity, and the Nellie Mae Foundation report titled, "New England 2020: A Forecast of Educational Attainment and its Implications for the Workforce of New England States."

In developing the strategic plan, the task force is to consider several factors, including how to partner public higher education institutions with the business community to move students into workforce shortage areas, and strategies necessary to promote and measure retention and graduation rates. To date, however, the task force has not been constituted.

Accountability measures and strategic planning. Public Act 99-285 (codified at C.G.S. Sec. 10a-6b) required the Higher Education Coordinating Council, which was composed of the chairman of the boards of trustees and the chief executive officers of each constituent unit (i.e., chancellors), and the commissioners of higher education and education, and the Secretary of the Office of Policy and Management to develop accountability measures for each constituent unit and each public institution of higher education. The law also listed six new goals (identified in the middle column of Table VI-14) for which progress is to be measured:

- enhancing student learning and promoting academic excellence;
- joining with elementary and secondary schools to improve teaching and learning at all levels;
- ensuring access and affordability of higher education;
- promoting the economic development of the state to help business and industry sustain strong economic growth;
- responding to the needs and problems of society; and
- ensuring the efficient use of resources.

Accountability report. Since 2001, each constituent unit and BGHE has annually submitted an accountability report to the DHE commissioner, who then compiles the information and submits a consolidated report to the Higher Education and Employment Advancement

committee by February 1 each year. The report consists of updated baseline and peer comparison data, performance improvement targets for each measure, and other information as determined by the commissioner.

Accountability report. The report, called *Higher Education Counts Achieving Results*, contains a primary mission for Connecticut's higher education system, six statutorily-defined goals (noted above in Table VI-14), benchmarks, and performance indicators to measure progress towards achieving the established goals, for both the system as a whole and by constituent unit. One of the components of the mission statement is to "meet the workforce needs of the state's economy." The report provides key data on the performance of the state's public colleges and universities over time, which could be used in the General Assembly's ongoing efforts to incorporate the principles of Results-Based Accountability within its decision making processes.

The PRI committee believes that the six goals, performance indicators and improvement goals, along with the baseline data already contained in the *Higher Education Counts* report, should be incorporated into the strategic planning recommended below. Unlike some states that already have strategic higher education plans but little performance data, BGHE and the constituent units already has measured performance since 2001. Thus, the more difficult part is already being completed and the broader system vision and strategic plan will set a long-term direction.

The committee believes a strategic plan for higher education is critical to the optimum coordination of education with economic and workforce development efforts. Many elements that should be included in a strategic master plan are already captured in the *Higher Education Counts* report produced by DHE. However, other elements still need to be developed, such as establishing a vision for the higher education system and determining the actions necessary to implement the plan. In addition, a plan should provide a blueprint for linking the various goals and responsibilities of colleges and universities under the larger umbrella of the postsecondary system. The plan should address three other components of the talent pipeline, strategies to: 1) smooth the transition from the P-12 education system to the higher education system; 2) link the adult education and workforce development systems funded under the federal Workforce Investment Act to the higher education system; and 3) align the types of graduates it produces with the workforce needs of Connecticut's businesses and industries.

The Board of Governors of Higher Education is the appropriate entity to develop the plan since it is the policy-making and coordinating body across all higher education systems. **Therefore, the program review committee recommends:**

> **C.G.S. Sec. 10a-11b establishing the Blue Ribbon Task Force and requiring the task force to develop a strategic master plan every five years shall be repealed and its responsibilities, along with its reporting requirements, be transferred to the Board of Governors for Higher Education.**

C.G.S. Sec. 10a-6(a)(2) requiring the Board of Governors for Higher Education to develop a master plan shall be amended to include the word "strategic."

The goals that the Board of Governors for Higher Education, the Blue Ribbon Task Force, and the Accountability Measures are required to promote, be blended into a single set of goals that the strategic master plan should address. The goals identified in C.G.S. Sec. 10a-6(b) for the accountability report shall be adopted and amended to include the goal of protecting academic freedom and maintain standards of quality ensuring a position of national leadership for state institutions of higher education.

On or before January 1, 2011, and every five years thereafter, the Board of Governors for Higher Education shall prepare a higher education strategic master plan for the state. The plan shall be prepared in consultation with the Higher Education Coordinating Council, which includes the commissioner of the Department of Education and the Secretary of the Office of Policy and Management, and the commissioners of the Departments of Labor, and Economic and Community Development, the director of the Office of Workforce Competitiveness, the chairpersons and ranking members of the Higher Education and Employment Advancement and the Commerce committees, and the chairperson of the board and president of the Connecticut Conference of Independent Colleges, and the president of the Connecticut Business and Industry Association, or their respective designees. The Board of Governors for Higher Education may consult with other entities as determined by the board.

The plan shall be submitted to the Governor and the Commerce, Education, Higher Education and Employment Advancement, and Labor Committees.

The board shall report biennially on progress made toward achieving the benchmarks in the strategic plan.

Performance accountability. *Although the Higher Education Counts report has included performance measures and statistics on whether those measures are being met since 2001, there are no identified strategies put forth to address continued sub-par performance.* The most recent 2009 report shows the three-year graduation rate of first-time, full-time degree or certificate seeking students at community colleges was 10 percent for the cohort of students who entered in fall 2004; this rate is less than the 15 percent rate for all peers combined. Therefore, there is progress to be made, but the report identifies no improvement steps.

Of the more than 50 goals contained in the 2009 Higher Education Counts report, over one-third were unmet. Lack of response to performance data was a concern raised several times

in a review of Connecticut's Achieving the Dream Program by external evaluators.[44] The additional step of identifying strategies that the constituent unit intends to implement to address unmet goals will move the effort from simply passively reporting what is observed to identifying ways to meet the performance goal. **Therefore, the program review committee recommends:**

> **C.G.S. Sec. 10-6b(g) shall be amended to require each constituent unit of the state system of higher education and the Board of Governors for Higher Education to submit strategies to improve performance and achieve results on unmet goals or performance measures as part of its annual accountability report to the commissioner, along with funding estimates for each proposed strategy. The commissioner of the Department of Higher Education shall include these strategies in its annual consolidated report to the Higher Education and Employment Advancement Committee. The commissioner shall also submit the report to the chairpersons and ranking members of the Commerce and Education Committees.**

In addition to the problem of not identifying strategies to counter stagnant or declining trends, the program review committee found some goals already were being met at the time they were set (i.e., the bar had been set too low). Other statistics in the report may inaccurately reflect certain trends regarding student transfer between public colleges and universities. For example, graduation rates are reported by each constituent unit and college or university, but only are counted if first-time freshmen continue in the same school and obtain a degree (per federal rules, states are required to measure graduation rates in a three-year time frame for community college students and six-year period for public institutions offering baccalaureate programs). In reality, many students move from community colleges to other public colleges or universities without ever having degrees awarded, while others do not meet the established three- or six-year time frame but ultimately do graduate. These federal requirements do not preclude Connecticut from reporting graduation rate statistics to reflect this reality.

The program review committee also believes the report could be more user-friendly by adding a report card grade or an arrow next to a goal, to show the reader immediately if the goal has been met or progress is being made towards achieving it.

To address these deficiencies, the **program review committee recommends:**

> **Beginning July 1, 2010, the Higher Education Coordinating Council shall review the accountability measures developed under C.G.S. 10-6(b)(g), and every five years thereafter, determine their continued validity, or need for revision. Any revisions or deletions shall be submitted to the Board of Governors for Higher Education for approval.**

[44] *Achieving the Dream in Connecticut: State Policies Affecting Access to, and Success in, Community Colleges for Students of Color and Low-Income Students*, by Kevin K. Dougherty and Monica Reid, Community College Research Center, Teachers College, Columbia University, November 11, 2006.

Upon BGHE approval, the commissioner of the Department of Higher Education, on behalf of the council, shall notify the committees of cognizance on any measures that were revised or deleted, with a brief explanatory statement.

The Achieving Results Higher Education Counts report should include a letter grade or other symbol that represents, at a glance, whether or not the goal is being achieved.

According to the Department of Higher Education, the Higher Education Coordinating Council was constituted and it did develop the accountability measures. However, PRI staff were told by DHE staff that the council has not met for some time (the last time could not be remembered and no meeting minutes exist) and its composition was changed at some point to include only the chief executive officers before becoming inactive. Department staff indicated that the commissioner is making plans to reconstitute the council.

The PRI committee found that since the statutory mandate was never eliminated, the council should still be functioning since it presents an opportunity for collaboration and discussion around various inter-constituent unit issues, as well as promotes the concept of a statewide focus. **Therefore, the program review committee recommends:**

The Higher Education Coordinating Council should be reconstituted in accordance with C.G.S. Sec. 10a-6a.

Rewarding outcomes. Also noted above, the Board of Governors no longer has budget authority over the constituent units. Although a single consolidated budget is submitted to the legislature by the board, appropriations are made directly to each of the constituent units. Rewarding colleges or universities that are making progress towards or meeting the already established and legislatively approved goals contained in the *Higher Education Counts* report is one way in which incentives to encourage innovative practices can be provided.

Although the PRI committee realizes that the state is in the midst of a serious financial crisis, in the future, providing a discretionary pool of dollars to DHE to reward constituent units or individual college or university performance towards improving or meeting goals should be considered. This pool of money would be similar to the Health and Education Initiative funds that are appropriated by the legislature that currently gives discretion to the Department of Higher Education commissioner to fund postsecondary initiatives in these two areas. **Therefore, the program review and investigations committee recommends:**

Within available appropriations, a pilot program shall be established within the Department of Higher Education to be used at the discretion of the commissioner, to reward colleges, universities, or systems that are meeting pre-established goals.

Linking the Postsecondary Education System to Competitive Sector-Based Jobs

In Connecticut, the current state organizational structure to facilitate the coordination of postsecondary education with workforce development issues involves a myriad of agencies, boards, higher education institutions, offices, councils, and commissions. Some have overlapping responsibilities, but there is no single entity with authority to implement across-the-board strategies, policies, or programs.

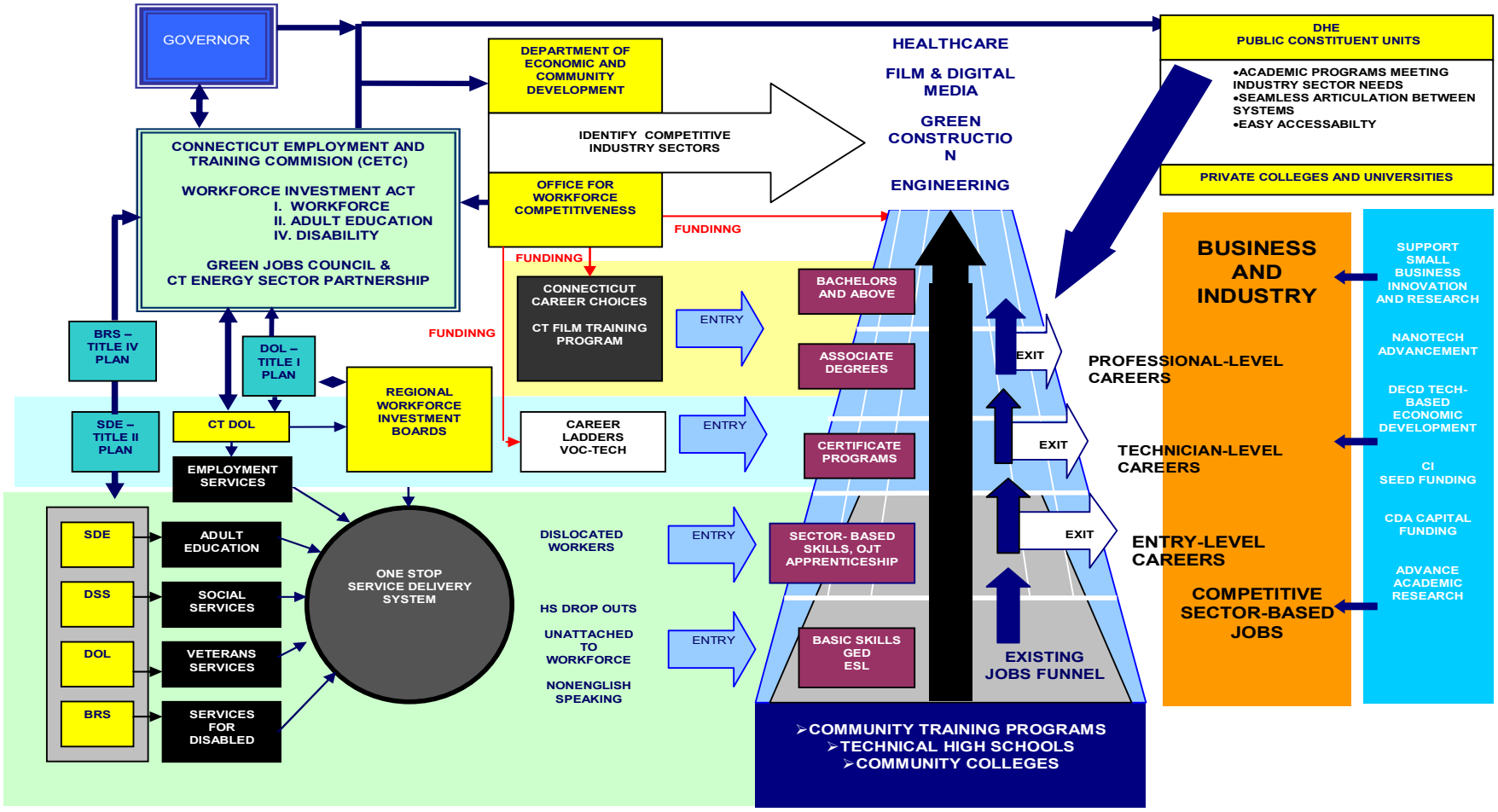
In the absence of a major restructuring of Connecticut's higher education system, such as centralizing budgetary authority within BGHE and basing a portion of a college's funding on graduation outcomes, the program review committee believes an approach developed by the Office of Workforce Competitiveness (and adopted by the Connecticut Employment and Training Commission) could improve the ability of the postsecondary system to promote Connecticut's economy. This approach links the establishment of postsecondary career pathways to economic sectors, such as technology and healthcare, which Connecticut views as economic drivers. It also builds on all the workforce components of the system, incorporates higher education into the design, and then links it to Connecticut's most competitive sectors.

The approach integrates the adult education system and the workforce development that is primarily funded under the federal Workforce Investment Act, with the postsecondary education system, and connects them to jobs in competitive sectors of Connecticut's economy. Figure VI-11 illustrates the flow of students who may enter the postsecondary system at one level and, upon exit, find a competitive sector-based job, or progress to the next educational level by building on an already articulated career pathway.

This framework also recognizes the organizational constraints imposed by the federal government on the workforce development system through the federal Workforce Investment Act and the structure that must be in place to receive those funds. The proposed framework is based on the perspective and needs of the students and adult individuals being served by the regional Workforce Investment Boards and seeks to more formally integrate that system with the public postsecondary system, and to careers available in vital sectors of Connecticut's economy. **Therefore, the program review and investigations committee recommends:**

> **The Office of Workforce Competitiveness, in consultation with the Connecticut Employment and Training Commission, the Departments of Higher Education, Education, Labor, and the Economic and Community Development, shall identify the sectors or sub-sectors in which career pathways need to be established, the workforce skills needed in those sectors, and the types of postsecondary programs that need to be developed to address the workforce needs in those sectors. The information shall be provided to the Board of Governors for Higher Education biennially.**

Figure VI-11. SECTOR-BASED EDUCATION AND TRAINING PATHWAY



Source: Office of Workforce Competitiveness

Creation of career pathways for employment in competitive industries. Many states, including Connecticut, are beginning to create new or grow existing academic programs in order to better align the production of graduates with businesses and industries that are experiencing shortages of skilled workers. Economic development policy recognizes that if a skilled workforce does not exist, the state will be less likely to attract certain businesses because it is too expensive for companies to come here and import the workforce from other states. The state may also lose existing businesses if there is not a readily available workforce.

Because of the decentralized nature of the public higher education system, a high degree of coordination and collaboration is necessary to ensure Connecticut's colleges offer a wide range of academic programs at all levels to prepare students for 21st century jobs. As the central policy-making body, the BGHE should be able to readily identify the strengths and weaknesses that exist across the systems and propose solutions that have impact beyond just a single constituent unit.

Currently, BGHE approves new and discontinued academic programs for most colleges and universities in the state, but the proposal is generated by the individual college or university. The committee believes that BGHE could also exercise a proactive role, based on information produced by the Office of Workforce Competitiveness in the recommendation above, in identifying where program certificate or degree gaps exist and how the public system of higher education can address those gaps.

In addition, this is when articulation agreements among colleges should be developed so that career pathways providing for easy transfer of students can be more seamless. This also could be an area for the Higher Education Coordinating Council to examine when it is reconvened and it could put forth recommendations to BGHE. Since the board has a statewide perspective, the board could issue an annual statement identifying areas of need in order to attract either public or private colleges to offer a new program. Otherwise, changes will continue to be incremental and depend solely on the initiative of each constituent unit, college within each unit, or independent institution. **Therefore, the program review and investigations committee recommends:**

> **Using information developed by the Office of Workforce Competitiveness, the Higher Education Coordinating Council shall make recommendations to the Board of Governors for Higher Education regarding postsecondary certificates and/or degree programs needed to address any shortages, or if existing programs lack capacity to address shortage areas.**

Strategies should be identified that will promote ongoing alignment of educational and business needs to meet the demand for qualified graduates at all educational and training levels, from middle-skills certificates and degrees to post-doctoral education and research. Promoting career pathways is particularly important in Connecticut as the demographic changes that are anticipated over the next decade will likely have more in-state students entering postsecondary school at the community college level.

Newly Proposed Coordinating Body

As noted in Chapter V, the September 2009 *Economic Strategic Plan* developed by the Department of Economic and Community Development states that the way for the state to remain competitive is by growing talent and being prepared for the technological jobs of the future. To accomplish this, there are several strategies identified in the plan. To provide oversight and ensure implementation, the department proposed a new Workforce and Education Cabinet be established.

The cabinet would consist of the following members: the commissioners of SDE, DHE, DOL, and DECD (or designees); the secretary of OPM (or designees); the heads of OWC, the Connecticut Development Authority, and Connecticut Innovations, Inc.; the chairs of the State Board of Education and the Board of Governors for Higher Education; and the boards of trustees of UConn, UConn Health Center, Connecticut State University System and the state community college system.

Among the strategies the cabinet would provide oversight for include: 1) building the capacity for economic and workforce analysis, including examining occupational supply and demand information; and 2) increasing the number of postsecondary students seeking degrees in STEM areas, by creating a $100 million, public-private student loan partnership, offering loan forgiveness in critical shortage occupations such as science and engineering.

Technical High Schools and Adult Programs

Currently the Connecticut Technical High School system offers six adult education programs. Five of the programs are in the health field and one is offered in the aviation maintenance. The programs are:

- licensed practical nurse;
- dental assisting;
- certified nurse assistant;
- medical assistant;
- surgical technology; and
- aviation maintenance technician.

Governor Rell recently suspended the LPN program offered at the ten technical schools, although individuals who are currently enrolled will be allowed to complete the program. Noting that the LPN program has operated since the 1950s, a spokesperson for the state Department of Education stated that the program is for adults and is not part of the technical schools' core mission.

The program review committee believes that the Connecticut Community College System is a better location to offer adult education programs now provided at technical high schools, particularly since career pathways already exist for some programs, such as for LPNs seeking to enroll in RN programs. Offering programs through the community college system also

exposes adults to a higher education environment where other career opportunities are more apparent. **The program review committee recommends:**

> **The Connecticut Community College System, in consultation with the commissioners of the state Department of Education and the Department of Higher Education, and the superintendent of the Connecticut Technical High School system, shall examine the feasibility of transferring the adult education programs currently offered by the technical high schools, including the licensed practical nurse program, to the Connecticut Community College System.**
>
> **The Board of Trustees for the Connecticut Community College System shall report to the legislative committees of cognizance on the feasibility of such a transfer including the cost of such transfer, the number of employees that would be impacted, and if such a transfer occurred, the geographic locations where the programs could be offered by October 1, 2010.**

Chapter VII

Green Collar Jobs

This chapter describes the emerging field of green collar jobs and how education is aligning with the needs of the new field. The information is organized into answering the four "D's" of the green collar field:

- What is **driving** the green movement?
- How are green collar jobs **defined**?
- Who is **developing** the green collar field and where will job opportunities be?
- What green collar job education and training is being **delivered**?

Figure VII-1 provides a roadmap for this chapter's information on the four D's of the green collar field. The green movement in Connecticut is being driven by a confluence of forces including an array of grants stemming from the American Recovery and Reinvestment Act of 2009, Governor Rell's executive order establishing a blueprint for green collar jobs creation, a host of green-related statutory changes, and the private sector. This chapter will also describe the multitude of green collar job definitions and inherent challenges in defining an emerging field. The efforts of the many agencies, organizations, and companies working to develop the green collar field are described, and projections of where future job opportunities will be are given. The chapter concludes with an overview of the roles of the public postsecondary institutions, independent colleges and proprietary schools, and technical high schools in delivering education and training to prepare individuals for green collar jobs.

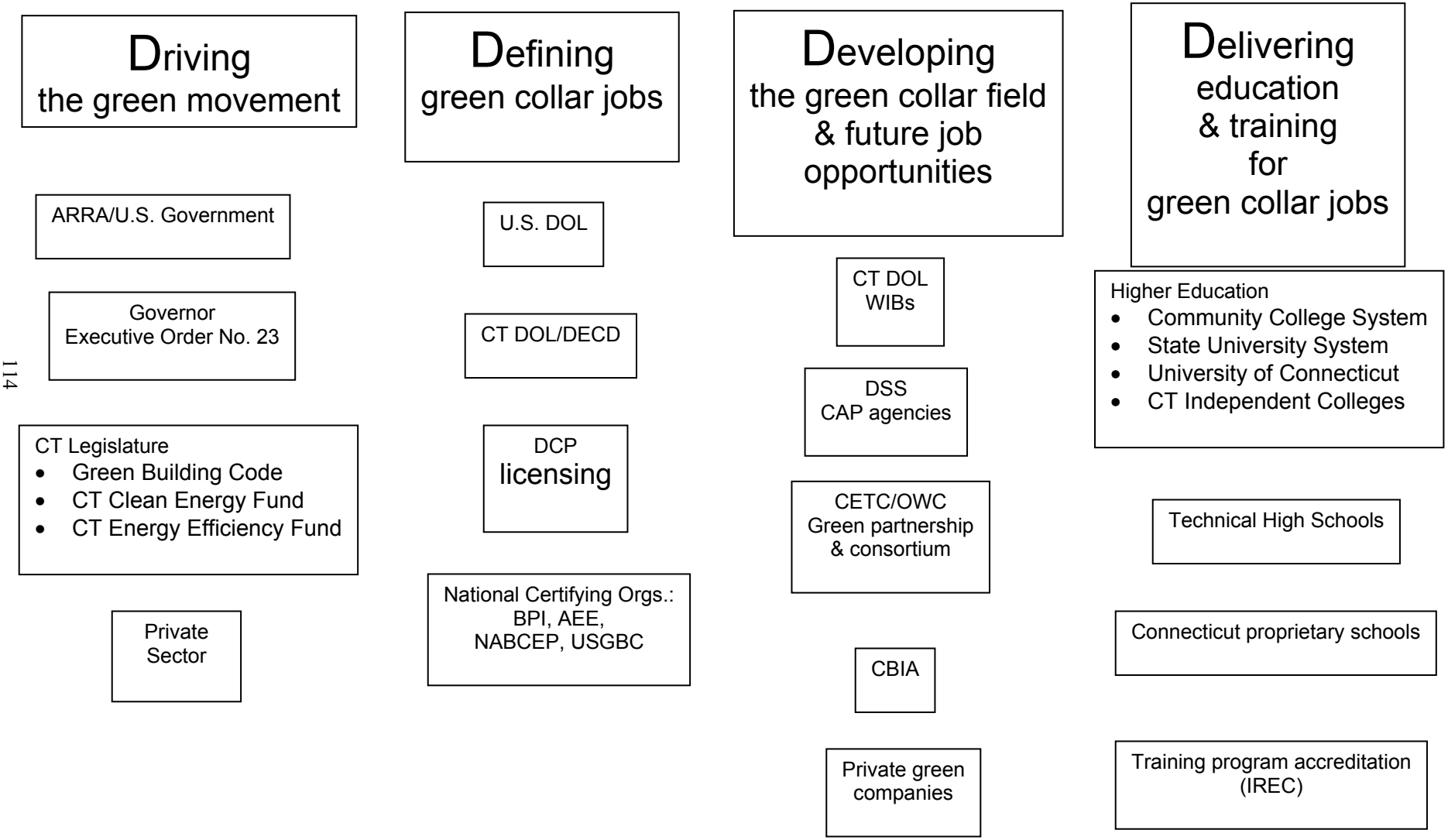
What is Driving the Green Movement?

The first "D" is understanding what is *driving* the green movement. One of the driving forces of the green movement within Connecticut and nationally, is the *American Recovery and Reinvestment Act of 2009 (or ARRA).* Federal stimulus funding from ARRA is expected to deliver an influx of at least $50 billion nationally to the energy efficiency and renewable energy sectors and create 500,000 green jobs by the end of 2010.[45] Another driving force is *Governor Rell's Executive Order No. 23,* which established a blueprint for green collar jobs creation. The executive order calls for a number of efforts including the establishment of a Green Collar Jobs Council – subsequently renamed the Connecticut Energy Sector Partnership -- and an Energy Workforce Development Consortium, to advise the partnership on current and future workforce needs of energy-related companies in the state.

Yet anther driving force of the green movement within the state are *recent Connecticut statutory changes* promoting green building code requirements, and implementing green strategies through the Connecticut Clean Energy Fund and the Connecticut Energy Efficiency Fund. The *private sector* also plays a role in driving the green movement, establishing and

[45] *Preparing the Workforce for a "Green Jobs" Economy*, research brief from the John J. Heldrich Center for Workforce Development, February 2009.

Figure VII-1. The Four D's of the Green Collar Field



Source: PRI staff analysis

expanding companies and initiatives in the energy sectors, and leading the way internationally in the commercial fuel cell industry.

American Recovery and Reinvestment Act of 2009 is driving the green movement. The American Recovery and Reinvestment Act of 2009 (ARRA) is a national effort to create or save jobs, jump start growth and transform the economy for the 21st century. Federal stimulus funding from ARRA is expected to generate many green collar jobs. To date, Connecticut has been awarded $120,767,152 in stimulus funds for green efforts; four other grant applications totaling $13,637,680 are pending. Because they are such a significant driver of the green movement, each of the ARRA grants pertaining to green collar jobs is now briefly described.

ARRA Green Grants Awarded. The recent federal stimulus funding will directly impact the available green workforce supply in Connecticut. Table VII-1 shows a sample of jobs to be created from the federal American Recovery and Reinvestment Plan as projected by the University of Massachusetts-Amherst Department of Economics and Political Economy Research Institute.

Table VII-1. Projected Green Collar Investments and Jobs

Strategy	Sample Jobs
Building Retrofitting	Electricians, Heating/Air Conditioning Installers, Carpenters, Construction Equipment Operators, Roofers, Insulation Workers, Carpenter Helpers, Industrial Truck Drivers, Construction Managers, Building Inspectors
Mass Transit/Freight Rail	Civil Engineers, Rail Track Layers, Electricians, Welders, Metal Fabricators, Engine Assemblers, Bus Drivers, Dispatchers, Locomotive Engineers, Railroad Conductors
Smart Grid	Computer Software Engineers, Electrical Engineers, Electrical Equipment Assemblers, Electrical Equipment Technicians, Machinists, Team Assemblers, Construction Laborers, Operating Engineers, Electrical Power Line Installers and Repairers
Wind Power	Environmental Engineers, Iron and Steel Workers, Millwrights, Sheet Metal Workers, Machinists, Electrical Equipment Assemblers, Construction Equipment Operators, Industrial Truck Drivers, Industrial Production Managers, First-Line Production Supervisors
Solar Power	Electrical Engineers, Electricians, Industrial Machinery Mechanics, Welders, Metal Fabricators, Electrical Equipment Assemblers, Construction Equipment Operators, Installation Helpers, Laborers, Construction Managers
Advanced Biofuels	Chemical Engineers, Chemists, Chemical Equipment Operators, Chemical Technicians, Mixing and Blending Machine Operators, Agriculture Workers, Industrial Truck Drivers, Farm Product Purchasers, Agricultural and Forestry Supervisors, Agricultural Inspectors

Source: University of Massachusetts-Amherst Department of Economics and Political Economy Research Institute (PERI), *Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy*, September 8, 2008

Table VII-2 shows the anticipated green skills training for new and current workforce members expected as a direct result of ARRA green grants awarded. Training ranges from explaining the new green building code to current building officials, to the creation/expansion of certificates in such areas as solar energy technologies and precision manufacturing.

Table VII-2. ARRA Green Grants Awarded to Connecticut

Grant	Direct Impact on Green Collar Jobs/Training
State Energy Program (SEP) • $38,542,000 • U.S. Dept. of Energy • Approved: 4/1/09-3/31/12 • Applicant: OPM	• Supports energy efficiency/renewable energy programs/initiatives • Will include training of building operators and building officials in new green building code • Also includes building code update incorporating new Connecticut requirements for residential buildings and commercial buildings
DSS Weatherization Assistance Program • $64,310,502 • U.S. Dept. of Energy • Approved: 4/1/09-3/31/12 • Applicant: DSS	Authorizes OWC and Connecticut Community College System (CCCS) to assist DSS in the provision of weatherization training services with the involvement of the Regional Workforce Investment Boards and Jobs Funnel programs. Training and Technical Assistance will include: • Statewide lead safe training on new DOE minimum standards • Energy auditor certification training (one to two-day courses) • Also short-term on-the-job training for crews, energy auditors, and subcontractors • Two-week core competency training includes safe work practices, building evaluation, and measurement
Energy Efficiency & Conservation Block Grant • $9,593,500 • U.S. Dept. of Energy • Approved: 8/1/09-7/31/12 • Applicant: OPM/Energy Management Unit	• Used to provide sub-grants to 143 local Connecticut governments not otherwise eligible for direct formula grants • Minimum of $25,000 per municipality, increased depending on population • Funding must be used in a manner that is consistent with the state's energy policy framework (C.G.S. Sec. 16a-35k), P.A. 08-98, and Governor Rell's Connecticut's Energy Vision Plan
SOAR (Sustainable Operations: Alternative and Renewable Energy Initiative) • $2,000,000 • U.S. Dept. of Labor • Approved: 2/15/09-2/14/12 • Applicant: Connecticut Community College System	Creates eight certificate programs (for credit) at the state's community colleges: 1. Sustainable Facilities Management 2. Sustainable Landscape Ecology & Conservation Technician 3. Building Efficiency & Sustainable Technologies Certificate/Sustainable Facilities Management 4. Alternative Energy Transportation 5. Clean Water Treatment 6. Solar Energy Technologies 7. Alternative Energy Systems 8. Sustainable Energy Certificate 320 students will earn a CCCS Sustainable Operations Certificate in one of these eight areas and: • 85% of SOAR students will enter employment • Regional Coordinators will work with 900 clients/students, train 350 One-Stop and high school counselors • 20 college instructors will receive professional development training, and will train 800 students annually

Table VII-2 Continued. ARRA Green Grants Awarded to Connecticut	
Grant	**Direct Impact on Green Collar Jobs/Training**
SMART (Skills for Manufacturing and Related Technologies) Initiative • $2,191,400 • U.S. Department of Labor • Approved: 4/1/08-3/30/11 • Applicant: Connecticut Community College System	Creates/expands three community college certificate programs, with target of 331 students achieving credentials: • Pre-Manufacturing Certificate program • Level One Precision Manufacturing Certificate program • Level Two Precision Manufacturing Certificate program (offering specialties in precision machining and computer numerical control technologies, welding technology, and electronics control technology, and featuring a paid internship)

Making 'Green' Real Grant
• $3,999,923 ($250,000 for CT)
• U.S Department of Labor
• Approved: 12/1/09-5/31/11
• Applicant: Vermont Department of Labor (on behalf of Northeast Research Consortium)
	• Includes 6 New England states plus New York and New Jersey; Vermont will lead the consortium
	• Purpose: create a regional infrastructure to allow businesses and workers who employ, train or work in energy efficiency and renewable energy fields, to have access to reliable information
	• Consortium's work to be conducted in four phases:
	  o Creation of clear definitions and coding tools
	  o Demand analysis estimates including 6-12 month vacancy projections
	  o Use and extension of current labor market information tools, data collections and databases
	  o Creation of electronic and other dissemination tools including green job banks

Green Capacity Building Grant YouthBuild Bridgeport • $59,894 • U.S. Department of Labor • Approved: 12/1/09-11/30/10 • Applicant: The Workplace, Inc., Bridgeport	• Intended to build the green training capacity of current DOL grantees • Goal: train 20 students (17-24 years old) currently enrolled in project prepare for careers in emerging energy-efficient green building construction and retrofit industries • Successful completion of the program will qualify graduates for Carpenters Union, Local 210 apprenticeship programs • Will also train five local instructors by trainers from the Home Builders Institute
Green Capacity Building Grant YouthBuild Hartford • $69,933 • U.S. Department of Labor • Approved: 12/1/09-11/30/10 • Applicant: Co-Opportunity, Inc., Hartford	• Intended to build the green training capacity of current DOL grantees • Goal: train 20 students (17-24 years old) currently enrolled in the YouthBuild project to prepare for careers in deconstruction (dismantling buildings with goal of preserving reusable materials and reducing landfill needs) • Also certify 2-3 YouthBuild instructors as trainers for deconstruction, and provide internships to 3 YouthBuild students
Source: PRI staff analysis of federal green grant applications	

Pending ARRA Green Grants. As of December 2009, there are also several ARRA grant applications pending notification that would also have a direct impact on green collar jobs/training should they be awarded to Connecticut. Table VII-3 shows the pending ARRA green grants for Connecticut, featuring aspects of the grants that, if awarded, would impact green collar jobs/training.

Activities would range from training building analysts and clean water technicians, to increasing members of the green construction trade. A more complete description of awarded and pending ARRA grants to Connecticut is found in Appendix G.

Table VII-3. Pending ARRA Green Grants for Connecticut

Pending Grant Application	Direct Impact on Green Collar Jobs/Training if Awarded
CT Green Jobs Partnership (SESP) • $3,360,000 • U.S. DOL • Approx. 1/1/10-12/31/12 • Applicant: CETC	• Building Analyst Training at the CT Community Colleges (100 candidates over three years) • Green Manufacturing –Lean/Green (30 to get certificates) • Clean Water Technicians (65 certified at Wastewater Technician Level III), by Goodwin and Gateway Community College • Municipal Building Officials Training in Renewable Energy/Energy Efficiency Inspection for 180 participants o via Institute for Sustainable Energy at ECSU—half-day workshops for building code officials

***Energize CT!* A Statewide Energy Training Partnership**
• $2,210,800
• U.S. Department of Labor
• Approx. 1/1/10-12/31/12
• Applicant: CT Energy Workforce Development Consortium
	• Train 766 workers in three growing occupations:
	  o Solar PV/solar thermal/geothermal installers
	  o Diesel engine mechanics
	  o Energy efficiency building managers

Pathways Out of Poverty
• $3,066,880
• U.S. Dept. of Labor
• Approx. 1/1/10-12/31/12
• Applicant: Capital Workforce Partners WIB
	Place 350 Hartford residents in jobs in the green construction and sustainable energy generation industries
	• CCSU's Institute for Technology and Business Development to give orientation to emerging green economy, and introduction to sustainable energy generation
	• Other postsecondary institutions will provide green-focused certificate and degree programs that participants will access via individual training accounts
	• Three labor partners to provide green construction training and assist with subsequent placements:
	  o New England Laborers' Training Academy
	  o Ironworkers Local #15 Apprenticeship Program
	  o Finishing Trades Institute of Southern New England

"Green-up Bridgeport" Pathways Out of Poverty • $5,000,000 • U.S. Department of Labor • Approx. 1/1/10-12/31/12 • Applicant: The Workplace, Inc., Southwestern CT's WIB (Bridgeport)	• Focus on entry level green skills in established occupations that are projected to have increased demand • Education and training offered by ECSU, CCSU, Gateway CC, Housatonic CC, Norwalk CC, and U. of Bridgeport • Serve 600 participants in beginning education and training activities

Source: PRI staff analysis of federal green grant applications

Executive Order No. 23 is driving the green movement. The executive order regarding green collar jobs, which was issued on February 2, 2009, specifies the need to design initiatives

and programs to spur the growth of green collar jobs in Connecticut and directs such planning to begin in four ways.

First, the commissioners of DECD and DOL are to plan for the development and growth of green industries and green jobs, in coordination with the executive director of the Office of Workforce Competitiveness (OWC), the commissioners of SDE, DHE, and DEP, and the chancellor of the community college system. Developed June 2009, the plan was presented to the Connecticut Employment and Training Commission (CETC).

Second, CETC was to create and chair the Green Collar Jobs Council, which is composed of representatives from: the Departments of Education, Higher Education, Environmental Protection, Labor, and Economic and Community Development; the newly created Energy Workforce Development Consortium; and representatives from business and industry.[46] The council name was subsequently changed to the Connecticut Energy Sector Partnership in order to better position the state for federal funding (ARRA) opportunities.

The Connecticut Energy Sector Partnership structure (Figure VII-2), which was distributed at the first meeting of the partnership (August 20, 2009), recognizes the need for collaboration by the many state agencies. The purpose of the partnership is to develop green collar job opportunities, public-private partnerships, and job training programs.

The partnership is charged with developing and implementing a state energy sector strategic plan as required by the U.S. DOL in its solicitation of grant applications for State Energy Sector Partnership and Training Grants. As described under the pending ARRA grant applications, state WIBs applied for "Pathways Out of Poverty" workforce preparation grants to meet the needs of energy efficiency, renewable energy, and other green industries. The OWC provides administrative support and coordinates efforts for the partnership.

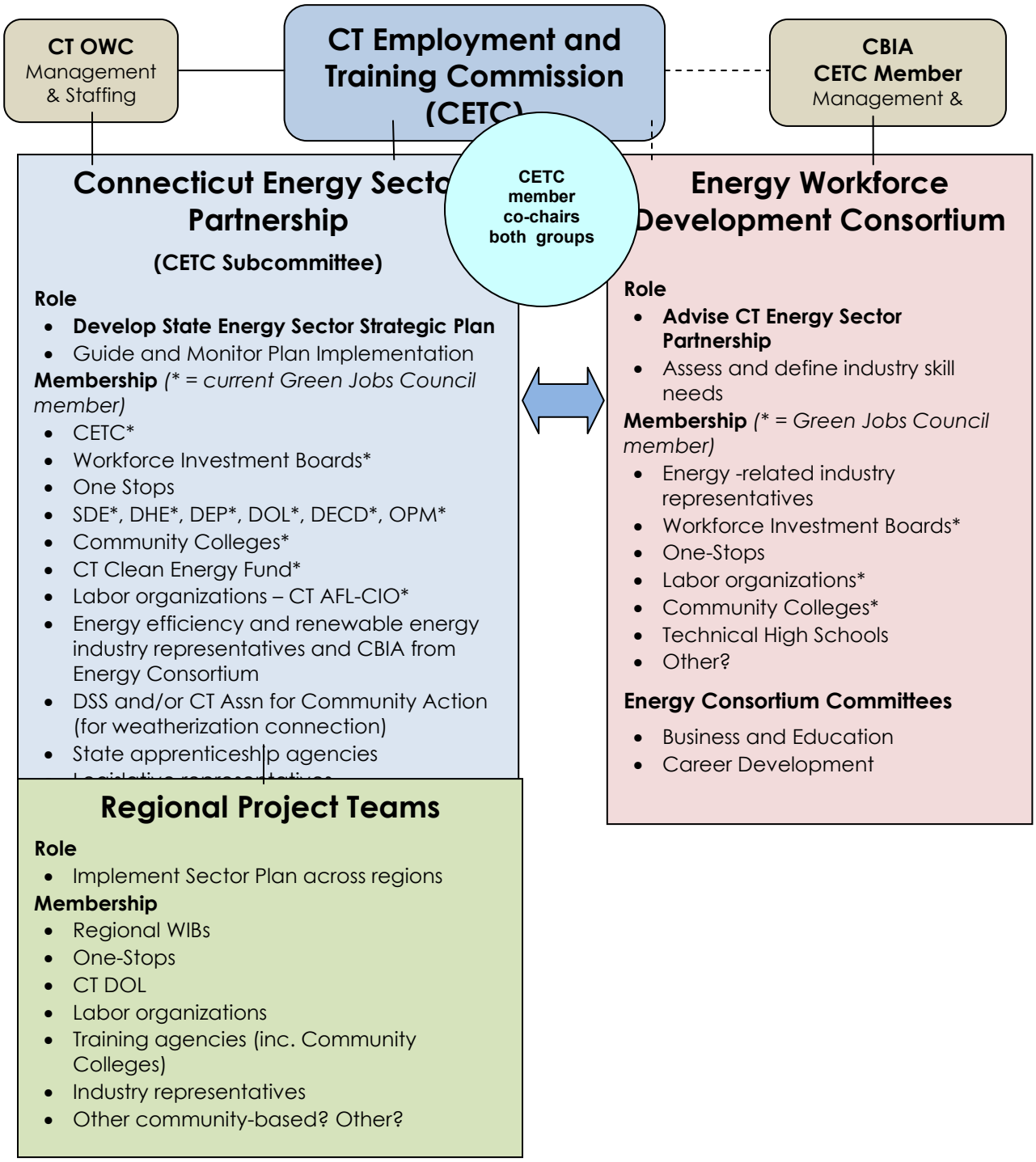
The Energy Workforce Development Consortium, which includes many of the same members of the Connecticut Energy Sector Partnership, is intended to advise the partnership and assess and define industry skill needs. Specifically, the consortium is charged with identifying challenges and developing solutions (with DECD) to meet the current and future workforce Association staffs the consortium.

Third, the community college system was to expedite the creation of eight certificate credit programs and train 320 students within the next three years. A grant from the U.S. DOL was recently awarded to Connecticut to support this effort (see SOAR grant in Table VII-2).

[46] The mission of the Connecticut Energy Workforce Development Consortium is to "define the industry's needs as it relates to workforce development, build awareness of the demand for energy personnel in the state, generate a sense of excitement around the industry, improve training programs to closely align classroom learning with workplace requirements, and create pathways to continuing education, certification and employment for high school and college graduates." Members include executives from traditional and alternative energy companies, manufacturers of energy-related products, workforce investment boards, and representatives from technical high schools, community colleges, and universities. The consortium is staffed by CBIA.

Figure VII-2. Connecticut Energy Sector Partnership Structure

(formerly Connecticut Green Collar Jobs Council)



Fourth, OWC was to provide administrative support and coordinate efforts among the many state agencies, public and independent colleges and universities, and quasi-public agencies whose missions include green collar industries and jobs. The OWC management and staffing role is shown in the Connecticut Energy Sector Partnership Structure in Figure VII-2.

Beyond this executive order, the Governor's "Energy Vision" intends that 20 percent of all energy used and sold in the state will be from clean energy sources by the year 2020.[47]

Connecticut statutory changes are driving the green movement. The demand for green collar jobs is consistent with Connecticut's energy utilization and conservation policy that requires the conservation of energy resources, and the development and utilization of renewable energy resources, such as solar and wind energy, to the maximum practicable extent (C.G.S. Sec. 16a-35k). There are also several new statutory requirements driving demand for green jobs. For example, *Connecticut is the first state with a required green building code for public and private buildings*. In addition, there are two recent public acts that promote the greening of Connecticut and are expected to increase the demand for a green collar workforce, particularly in the building sector. They are:

- P.A. 07-242 (An Act Concerning Electricity and Energy Efficiency) increases the state's "green building" requirements for new school, commercial, and government buildings. Regardless of whether the contractor/owner is receiving state funding/bonding, the construction is required to meet specific energy and environmental standards such as the LEED silver standard or its equivalent.

- P.A. 09-192 (An Act Concerning Green Building Standards and Energy Efficiency Requirements for Commercial and Residential Buildings) delays the date (to July 1, 2010) when "green building" standards are to take effect. New construction and renovation of commercial, school, and residential (5+ family units) buildings of a certain square footage will be required to be green by adhering to LEED silver certification or its equivalent (e.g., Green Globes), as specified in the newly revised state building code.

Additionally, P.A. 08-98, the 2008 Global Warming Law, codifies Governor Rell's energy vision, mandates reductions in state greenhouse gas emissions, and makes changes designed to help the state achieve these reductions.

Energy funds. More than a decade ago, two funds were established to promote use of clean energy and energy efficiency in Connecticut.

Connecticut Clean Energy Fund. As described in a previous program review study,[48] the Connecticut Clean Energy Fund (CCEF) was established in 1998 to provide financing for

[47] *Connecticut's Energy Vision for a Cleaner, Green State*, Governor Jodi Rell's Energy Plan, 2006.
[48] *Energy Efficiency & Conservation Programs in Connecticut*, Legislative Program Review and Investigations Committee, January 2009.

alternative sources of energy. Funded by a surcharge on electric utility bills and administered by Connecticut Innovations, Inc. (a quasi-public agency), the fund's goals are to:

- create a clean energy supply for Connecticut,
- accelerate the development of clean energy technologies, and
- educate Connecticut consumers about the benefits and availability of clean energy.

The fund is undertaking initiatives in postsecondary education institutions. For example, under the direction of its FY09-FY10 Comprehensive Plan, CCEF intends to support community college initiatives through funding expensive equipment needed for training in renewable energy. Beneficiaries of this support will be Gateway and Naugatuck Valley community colleges, which have been identified as currently having the necessary laboratory setting and regional base from which to draw students. The fund also provides financial support to the University of Connecticut Center for Clean Energy Engineering (previously known as the Connecticut Global Fuel Cell Center).

The Connecticut Clean Energy Fund has several initiatives to introduce and potentially encourage students at the primary and secondary education level to consider careers in the green field. For example, the Learning for Clean Energy Innovation is a program that gives ninth grade teachers a broad knowledge of alternative energy sources. So that they may introduce these concepts into the classroom, to date, 180 teachers have participated in one-day workshops on solar photovoltaic energy. The solar education unit introduced at the workshop was developed in consultation with the State Department of Education, education experts and consultants, and the National Renewable Energy Laboratory. In 2009, the program also began offering professional development workshops on wind energy.

The Connecticut Clean Energy Fund Board of Directors recently approved funding for expansion of the Learning for Clean Energy Innovation program within Connecticut's technical high school system. The program will build teacher capacity to train students for clean energy jobs, focused on solar photovoltaic and solar thermal technologies, with shared equipment housed at three technical high schools (Wolcott, Grasso, and E.C. Goodwin).

Lastly, CCEF operates a Solar Photovoltaic (PV) Rebate Program to install solar energy products on residences, and on nonprofit and governmental sites. Requirements to become an installer for this program require PV-1 or E-1 licensure, having taken a PV installation training course, and completed at least three installations as the lead installer (or ten installations as an apprentice). As of November 2009, approximately 38 PV installers qualified to participate in this program.

Connecticut Energy Efficiency Fund. Connecticut has been nationally recognized as a leader in energy efficiency programs. The American Council for an Energy-Efficiency Economy, a nonprofit policy and research organization that evaluates state energy efficiency programs, ranked Connecticut among the top three states in 2006 and 2008.

The Connecticut Energy Efficiency Fund (CEEF) was created by legislation in 1998 and, like CCEF, is funded by a surcharge on electric utility bills. Programs funded through CEEF are administered by the electric utilities (Connecticut Light & Power, and United Illuminating) in conjunction with the gas utilities (Connecticut Natural Gas, Southern Connecticut Gas, and Yankee Gas). The purpose of CEEF is to advance efficient use of energy, reduce air pollution and other harmful environmental impacts, promote economic development, and provide energy security and affordability. Residents are offered incentives to replace older appliances with newer, more energy efficient models. Businesses are also encouraged to maximize energy efficiency and lower operating costs, keeping Connecticut employers competitive and in-state.

Private sector is driving the green movement. The private sector is another driver of the green movement. According to the director of the Institute for Sustainable Energy at Eastern Connecticut State University, there are only two commercial fuel cell companies in the world: United Technologies Corporation in South Windsor; and FuelCell Energy, Inc. in Danbury. Combined, the two companies have produced 400-500 units, including 10 fuel cell units used in Connecticut.

There are a number of Connecticut companies that received ARRA grants. Bouffard Metal Goods of Waterbury, for example, received $5,000,000 for an electric drive vehicle battery components program. Schuco of Newington, a world leader in aluminum, steel, PVC-U and solar products for building envelopes, was recently chosen by one of Southern California's leading solar energy companies to supply products for major solar photovoltaic projects,.

As companies make commitments to enter or expand in green areas, the workforce demand for green collar jobs increases. Additionally, the private sector partners with state agencies on the energy consortium, collaborates with college centers or institutes having a green focus, and serves on local advisory councils and energy fund boards.

Defining Green Collar Jobs

Beyond understanding what is *driving* the green movement, the second "D" is *defining* green collar jobs. Knowledge of which occupations are considered green collar jobs is a prerequisite to: estimating the size of the current green collar workforce; projecting future employer demand; and delivering education and training needed for green collar jobs.

There are a multitude of green collar job definitions produced by such entities as the U.S. Department of Labor, the Connecticut Department of Labor, Department of Economic and Community Development, and green job study groups and institutes. Table VII-4 gives examples of some of the definitions of green collar jobs and the green field. While there is currently no single generally accepted definition of green collar jobs or the green field, there are some common themes. Five of the seven definitions shown, for example, specifically mention **improving or preserving the environment**. Four of the definitions reference **"energy"** in three different ways:

- saving energy/reducing energy usage;
- advancing new energy efficient technologies/increasing the efficiency of energy usage; and
- expanding the use of renewable energy/fostering more sustainable energy.

Table VII-4. Various Definitions of Green Collar Jobs and the Green Field	
Source	**Definition**
DECD/DOL plan for green jobs in CT (per Executive Order No. 23)	Jobs that protect wildlife or ecosystems, reduce pollution or waste, or reduce energy usage and carbon emissions
Connecticut Department of Labor[1]	White and blue collar jobs in green businesses, whose products and services directly improve environmental quality
CT DOL Economic Digest, December 2008	Occupations with Standard Occupational Classification[2] definitions that indicate their direct contribution to preserving and enhancing the quality of the environment
Institute for Sustainable Energy at Eastern Connecticut State University[3]	• Jobs that preserve, restore, or improve the environment • Jobs that help save energy, advance new energy efficient technologies, and foster a more sustainable regional and national energy system • Either blue or white collar positions, updated to adopt sustainability as a core segment of the individuals' job description • Career opportunities capable of supporting a family's income, with the potential for advancement
Prepared by the National Center for O*NET (Occupational Information Network) Development for the U.S. DOL Employment and Training Administration	The green economy encompasses the economic activity related to reducing the use of fossil fuels, decreasing pollution and greenhouse gas emissions, increasing the efficiency of energy usage, recycling materials, and developing and adopting renewable sources of energy
Centers of Excellence of the California Community Colleges Economic and Workforce Development	An occupation that: • directly works with policies, information, materials, and/or technologies that contribute to minimizing environmental impact • requires knowledge, skills, training, or experience in these areas
Working definition from the Workforce Information Council Green Jobs Study Group, with membership from the U.S. Bureau of Labor Statistics and seven state departments of labor[4]	Jobs in which the work is essential to products or services that improve energy efficiency, expand the use of renewable energy, or support environmental sustainability. The job involves work in any of these green economic activity categories: • renewable energy and alternative fuels • energy efficiency and conservation • pollution, waste and greenhouse gas (GHG) management, prevention, and reduction • environmental cleanup, remediation, waste clean-up, mitigations • sustainable agriculture and natural resource conservation • education, regulation, compliance, public awareness, and training and energy trading

[1]CT Career Resource Network Update, LMI, *CT's Blueprint for Green Collar Job Creation*.
[2]The Standard Occupational Classification system, which is being adopted by all Federal statistical agencies for reporting occupational data, consists of 821 detailed occupations.
[3]In handouts distributed by the Institute for Sustainable Energy at the Hartford, New Haven and Fairfield County Federal Recovery Act Program--April 13, 14, and 17, 2009.
[4]Members included U.S. Bureau of Labor Statistics representatives, and state Department of Labor representatives from California, Colorado, Pennsylvania, Florida, New York, Connecticut, and Washington.

Preserving the environment is often linked with using less energy — referred to as **energy efficiency** (EE) — and/or with using an alternative source of energy that is not harmful to the environment — referred to as **renewable energy** (RE). It has previously been noted that Connecticut is a nationally recognized leader in energy efficiency programs. *Connecticut was one of just seven states awarded a "Gold Star" standard by a national organization, signifying its continued search for new and innovative opportunities to reduce energy use, strengthen building codes and appliance standards, promote renewable energy, and lower polluting emissions from cars*.[49]

Many green collar jobs are linked to energy efficiency or renewable energy. Less energy use, for example, is a goal of weatherization installers and technicians. Fuel cell engineers, on the other hand, are striving to develop a renewable energy product that chemically produces electricity without emitting environmentally harmful exhausts and gases. Table VII-5 shows energy efficiency and renewable energy technologies that are the focus of many green collar jobs.

Table VII-5. Energy Efficiency and Renewable Energy Technologies

Energy Efficiency Technologies	Renewable Energy Technologies
• High efficiency heating, ventilation, and air conditioning • Efficient lighting • Efficient home appliances • Water heating • Commercial refrigeration • Pumps, motors, and drives • Building envelope • Demand response (e.g., reduce consumption at peak/critical times)	• Fuel cells • Solar (PV and solar hot water) • Wind • Geothermal • Hydrogen (<5ML) • Hydrogen • Biomass • Storage • Power grid infrastructure

Source: *Connecticut Renewable Energy/Energy Efficiency Economy Baseline Study, Phase 1 Deliverable: Full Report*, March 27, 2009, by Navigant Consulting, Inc.

Challenges in defining green collar jobs. As is apparent, *one of the challenges in this emerging field is the difficulty in defining exactly what constitutes a green job*. An economist with the Connecticut DOL noted that green encompasses many areas of the economy, and which occupations are considered green vary from day to day.[50] Green may also be thought of as a philosophy or growing movement (green washing of America) that can encompass nearly every occupation. For example, in a plan prepared by DECD and the state DOL to develop green industries and green jobs in Connecticut (as required by Executive Order No. 23), 119 green occupations were identified including lawyers, janitors, and roofers.[51] A list of these 119 green occupations is provided in Appendix H.

[49] *America's Clean Energy Stars: State Actions Leading America to a New Energy Future*, research report prepared by Environment America Research & Policy Center, 2007.
[50] *How 'Green' is Connecticut's Economy?* by Nicholas A. Jolly, Ph.D., Economist Connecticut DOL, December 2008 Connecticut Economic Digest.
[51] *Plan to Develop Green Industries and Green Jobs in Connecticut*. Prepared by the Departments of Labor and Economic and Community Development, June 2009.

Elements of many occupations will include the need to possess green skills as federal, state, and local environmental and energy requirements evolve. Also, as the Connecticut DOL Director of Research noted, as technology improves, what is considered green today can be even greener tomorrow—there is always more green you can do. Conversely, some narrowly define green collar jobs to specifically include only well-paying jobs able to support a family.[52]

One approach to dealing with the challenges in defining an emerging field is to group occupations by the way in which they are impacted by the green movement.

Grouping of green collar jobs. The U.S. Department of Labor has defined three general categories for occupations in the green economy:

5. Green *increased demand* occupations – existing occupations performed within a green setting;
6. Green *enhanced skills* occupations – existing occupations requiring additional green skills and knowledge, and perhaps new credentialing; and
7. Green *new and emerging* occupations – new occupations that arose due to the green economy.

Table VII-6 provides examples of green occupations within each of the three U.S. DOL categories.

Table VII-6. Examples within the Three U.S. DOL Green Occupational Categories

Increased Demand	Enhanced Skills	New & Emerging
Chemical Engineers	Electrical Engineers	Carbon Trading Analysts
Computer Software Engineers, Systems Software	Industrial Engineering Technicians	Fuel Cell Engineers
Construction Carpenters	Machinists	Solar Photovoltaic Installers
Electric Power-Line Installers and Repairers	Plumbers	Weatherization Installers and Technicians
Industrial Machinery Mechanics	Power Plant Operators	Wind Energy Engineers

Source: National Center for O*NET Development (www.onetcenter.org)

Additional new and emerging green collar occupations identified by the Institute for Sustainable Energy at Eastern Connecticut State University are listed in Appendix I.

Estimates of number of green collar jobs in Connecticut. *The present general lack of consensus on what constitutes a green collar job has led to a variety of estimates on the current size of Connecticut's green collar workforce, ranging from 5,493 to more than 22,000 individuals.*

Estimates of green collar occupations based on licensure, certification, and accreditation. Green collar jobs may also be defined through green licensure, certification, and accreditation. Table VII-7 summarizes the types of green collar-related licenses, certificates, or

[52] Institute for Sustainable Energy at Eastern Connecticut State University.

accreditations and the number credentialed in Connecticut. (The licensing and certifying bodies will be described more fully later in this chapter.)

Table VII-7. Credentials Held by Connecticut's Green Collar Workforce		
License or Certificate or Accreditation	**Source of Certificate or License**	**Number Certified or Licensed in Connecticut**
Limited Licensed Solar Electric Contractors (PV-1)	DCP	15
Limited Licensed Solar Electric Journeypersons (PV-2)	DCP	13
Licensed Solar Thermal Contractors (ST-1)	DCP	93
Licensed Solar Thermal Limited Journeypersons (ST-2)	DCP	12
Building Performance Institute Accredited Contractors	BPI	2
Building Performance Institute Certified Technician	BPI	125
Business Energy Professional (BEP)	AEE	11
Certified Building Commissioning Professional (CBCP)	AEE	10
Certified Cogeneration Professional (CCP)	AEE	1
Certified Demand-Side Manager (CDSM)	AEE	10
Certified Energy Auditor (CEA)	AEE	15
Certified Energy Manager (CEM)	AEE	125
Certified Energy Procurement Professional (CEP)	AEE	14
Certified GeoExchange Designer (CGD)	AEE	8
Certified Indoor Air Quality Professional (CIAQP)	AEE	2
Certified Lighting Efficiency Professional (CLEP)	AEE	14
Certified Measurement & Verification Professional (CMVP)	AEE	3
Certified Power Quality Professional (CPQ)	AEE	2
Certified Carbon Reduction Manager (CRM)	AEE	6
Certified Sustainable Development Professional (CSDP)	AEE	13
Distributed Generation Certified Professional (DGCP)	AEE	4
Certified Energy Manager-In-Training (EMIT)	AEE	3
Certified Green Building Engineer (GBE)	AEE	7
Certified Solar PV Installers	NABCEP	8
Certified Solar Thermal Installer	NABCEP	1
Passed Entry Level (basic) Certificate Program Exam	NABCEP	27
LEED Green Associate	USGBC	29
LEED Green Advanced Professional	USGBC	1,214
Sources: Department of Consumer Protection, Building Performance Institute, Association of Energy Engineers, North American Board of Certified Energy Practitioners, U.S. Green Building Council		

Estimates of green collar jobs based on their contribution to environmental preservation and enhancement. Estimates of the current green collar workforce supply are produced by the Connecticut DOL based on Standard Occupational Classification (SOC) definitions and the department's selection of occupations that contribute directly to preserving and enhancing the quality of the environment. Using this methodology, there are 5,493 workers in green occupations in Connecticut (Table VII-8). *The most plentiful green jobs are natural sciences managers, water and liquid waste treatment plant and system operators, and environmental engineers.* Some of the occupations shown include coursework that would encompass green technology, but no specific license or certification is required.

Table VII-8. Number Employed in Environmental Preservation and Enhancement Occupations		
Occupation	**Estimated # Employed in 2006**	**Education Level Required**
Natural Sciences Manager	933	Bachelor's plus work experience
Water/Liq. Waste Trtmt Plant & System Operator	856	Long-term on-the-job training
Environmental Engineer	747	Bachelor's
Environ. Scientist & Specialist	685	Master's
Environ. Science & Protection Tech.	392	Associate's
Nuclear Engineer	339	Bachelor's
Environmental Engineering Technician	216	Associate's
Nuclear Technician	195	Associate's
Power Plant Operator	175	Long-term on-the-job training
Geoscientist	174	Master's
Nuclear Power Reactor Operator	108	Long-term on-the-job training
Hydrologist	97	Master's
Other[a]	576	
Total	**5,493**	

[a]Includes agricultural engineers, soil and plant scientists, zoologists and wildlife biologists, conservation scientists, and foresters.
Source: Office of Research, Connecticut Department of Labor, December 2008 Economic Digest

Estimates of green collar jobs based on employment in green industries. Another way the Connecticut DOL estimates green employment is by counting, regardless of occupation, the number employed in a green industry, based on whether the North American Industry Classification System (NAICS) manual defines the particular industry as producing a product or service that contributes directly to preserving and enhancing the quality of the environment. Using this definition, Appendix J provides detailed information on the 22,373 Connecticut residents working in green industries. Staff from the Connecticut DOL said *while the greatest numbers of green jobs in Connecticut are currently in waste management and remediation, the most lucrative jobs are in hydroelectric power generation.*[53] A breakout of the jobs of the 1,691 residents employed in renewable energy, and the 2,675 employed in energy efficiency areas is also provided in the appendix.

Yet another Connecticut DOL definition of green jobs in Connecticut combined industry and occupational information, and concluded that *the largest increase in green employment would occur in the occupational category, "management, scientific, and technical consulting services"* (29 percent increase).

Summary. *Regardless of the methodology used to define green collar jobs, all show an increase in green jobs.* The Connecticut DOL believes there will be a need for engineers and scientists to continue to advance the utility of new alternative energy sources and the development and application of new green products. A much larger segment of the workforce, however, will remain in their current occupations, but need to learn new skills and knowledge related to the production, installation, monitoring, maintenance and repair of these new green systems and products.

[53] Quoted in March 2, 2009 Hartford Courant article, *Green-collar Jobs: Two Rell Directives Would Create Environmentally Oriented Projects*.

Regulation by the Department of Consumer Protection defining green collar jobs. Licensing of persons working in particular occupations becomes increasingly important in a new and emerging field such as green collar jobs. Licensing assures consumers that practitioners have a basic level of competency, although *there is currently very little regulation of these new and emerging occupations*.

The Connecticut Department of Consumer Protection (DCP) issues licenses for work performed in three green/renewable energy areas: solar-thermal, solar-electric, and wind-electric. Table VII-9 shows the requirements for, and work permitted under, each type of green license.

Until summer 2009, in order to perform solar thermal work, individuals were required to hold either ST-1 or ST-2 solar thermal licenses, which limit the individuals to perform solar thermal work only. Connecticut recently added an alternative option, which allows only certain licensed individuals that hold other types of heating/piping/cooling and plumbing/piping licenses (excluding all residential heating/piping/cooling limited S type licensed contractors and journeypersons), to obtain a certificate to perform solar thermal work, provided the individual has completed a solar thermal installation training course and passed a solar thermal work exam as approved by DCP (C.G.S. Sec. 20-334a).

Table VII-9. Renewable Energy-Related State Licenses

License Number	License Name and Issuing Body	Requirements to Qualify for License	Work Permitted Under License
PV-1	• Limited solar electric contractor license • Issued by the Electrical Work Examining Board	2 years as licensed journeyperson or equivalent experience and training	• Limited to solar electricity systems • Includes wind generation systems
PV-2	• Limited solar electric journeyperson's license • Issued by the Electrical Work Examining Board	Completion of a registered apprenticeship program or at least 1 year or equivalent experience and training	• Limited to solar electricity systems under employ of contractor licensed for such work • Includes wind systems
ST-1	• Solar thermal contractor • Issued by the State Board of Heating, Piping, Cooling, and Sheet Metal Work Examiners	2 years as licensed journeyperson or equivalent experience and training	• Limited to solar hot water heating systems
ST-2	• Solar thermal limited journeyperson • Issued by the State Board of Heating, Piping, Cooling, and Sheet Metal Work Examiners	Completion of a registered apprenticeship program or at least 1 year or equivalent experience and training	• Limited to solar hot water heating systems under the employ of a contractor licensed for such work

Source: R.C.S.A. Sec. 20-332-2(m)(n), R.C.S.A. Sec. 20-332-5(hh)(ii)

National green collar certifying organizations defining green collar jobs. *In addition to state licensing of occupations in the green field, there are also national certifying organizations that are attempting to define green collar jobs through the establishment of professional competency standards that are recognized by others in the green field.* In an emerging field, such external seals of approval offer assurances to prospective employers and clients.

Certification of *energy efficiency professionals and/or contractors* is offered by the Building Performance Institute and the Association of Energy Engineers. Certification of *renewable energy installers* is offered by the North American Board of Certified Energy Practitioners.

Building Performance Institute. The Building Performance Institute (BPI) is a contractor credentialing organization aimed at improving the energy efficiency (i.e., weatherization) of existing homes. In order for a company to receive certification, all employees must be BPI-certified professionals, having demonstrated knowledge of how to apply house-as-a-system techniques in upgrading the energy efficiency of homes. Independent BPI inspectors review paper files and randomly sample a percentage of sites for inspection. While no formal experience is necessary to participate in most of the required written and field exams, the BPI website recommends potential applicants obtain training from a BPI affiliate and have some experience in the building performance industry. Courses available for small homes certification are: building analyst, building envelope, manufactured housing, heating, and air conditioning/heat pump. A multifamily building certification is also offered, with available courses in multifamily building analyst, energy efficient multifamily building operators, multifamily hydronic heating system design, and multifamily advanced heating.

The Building Performance Institute's website notes that there were 70 training affiliate organizations nationally in January 2009, and 121 such organizations by September 1, 2009 (with 116 more organizations in the process of becoming training affiliates). The institute attributes the rapid growth in training home performance professionals to funding for weatherization and energy efficiency retrofits provided under the American Recovery and Reinvestment Act of 2009: $5 billion through the Weatherization Assistance Program and $3 billion from the State Energy Program. BPI certification is also required for Energy Star contractors, and is reportedly a preferred certification among employers in the building trades.[54]

There are currently two BPI-credentialed contractors in Connecticut and 125 certified professionals. Additionally, there are two BPI training affiliate organizations in Connecticut, with several out-of-state national companies also offering BPI training.

Association of Energy Engineers. The Association of Energy Engineers (AEE) is a nonprofit international professional society with a presence in 78 countries, and a dual mission of promoting the scientific and educational interests of professionals working in the energy industry and advancing sustainable development efforts. AEE has been certifying professionals since 1981, requiring applicants to meet specific educational and/or experience criteria, and pass a written exam. Certifications are awarded by AEE for:

- energy managers;
- sustainable development professionals;
- energy auditors;
- business energy professionals;
- energy procurement professionals;

[54] John J. Heldrich Center for Workforce Development Research Brief, *Preparing the Workforce for a "Green Jobs" Economy*, by Jennifer Cleary and Allison Kopicki, February 2009. Energy Star provides online training to contractors on energy efficient building design.

- distributed general certified professionals;
- energy managers-in-training;
- carbon reduction managers;
- building commissioning professionals;
- measurement and verification professionals;
- lighting efficiency professionals;
- green building engineers; and
- power quality professionals.

According to the AEE website, the certified energy manager credential, for example, is widely accepted and recognized by the U.S. Department of Energy, Office of Federal Energy Management Programs, and the U.S. Agency for International Development.[55] It is the standard for qualifying energy professionals in the United States and internationally. There are currently 125 certified energy managers (CEM) in Connecticut; as outlined in a recently submitted grant to the U.S. Department of Labor, Connecticut is estimated to need another 70-100 CEMs in the future. If funded, certification training will occur at several of the community colleges, where there are faculty members with certification to train and help students prepare for the four-hour CEM certification exam (estimated to have a 30 percent passage rate on the first try).

Table VII-10 shows the number of Connecticut residents with certification in each of the AEE areas. There are a total of 166 residents with at least one certification; some residents have multiple certifications.

Table VII-10. Number of Connecticut Residents with AEE Certification as of October 2009

Certification	Count
Business Energy Professional (BEP)	11
Certified Building Commissioning Professional (CBCP)	10
Certified Cogeneration Professional (CCP)	1
Certified Demand-Side Manager (CDSM)	10
Certified Energy Auditor (CEA)	15
Certified Energy Manager (CEM)	125
Certified Energy Procurement Professional (CEP)	14
Certified GeoExchange Designer (CGD)	8
Certified Indoor Air Quality Professional (CIAQP)	2
Certified Lighting Efficiency Professional (CLEP)	14
Certified Measurement & Verification Professional (CMVP)	3
Certified Power Quality Professional (CPQ)	2
Carbon Reduction Manager (CRM)	6
Certified Sustainable Development Professional (CSDP)	13
Distributed Generation Certified Professional (DGCP)	4
Energy Manager-In-Training (EMIT)	3
Green Building Engineer (GBE)	7
TOTAL	**248**

Source: PRI staff communication with Association of Energy Engineers staff

[55] www.aee.center.org/certification/CEM/page.htm. (October 2009).

North American Board of Certified Energy Practitioners. The North American Board of Certified Energy Practitioners (NABCEP) is the national organization that certifies professional installers in the field of renewable energy. Certification is based on training and passage of an exam demonstrating knowledge of standards set by subject matter experts. Nationally, there are 936 certified solar photovoltaic (PV) installers and 112 certified solar thermal installers as of September 2009.

NABCEP has awarded solar PV installer certificates to eight Connecticut residents and solar thermal installer certification to one Connecticut resident. In addition to these two types of certification, small wind certification may become available in approximately six months.

Gateway Community College is listed as the only registered Connecticut provider of training for the NABCEP entry-level PV exam, which tests basic understanding of PV systems. Passing the exam results in receipt of a NABCEP basic certificate, which gets the graduate onto the worksite to gain the experience needed to sit for the more advanced NABCEP photovoltaic certificate.

To date, Gateway has administered the entry-level exam once, which was passed by 12 of its students. There are 15 additional Connecticut residents who have passed the entry-level exam after having taken coursework available from one of the other providers in the northeast region. Other states have many more NABCEP training providers. Massachusetts, for example, has nine providers (six of which are community colleges), and New York has 11 providers (six of which are at 2- or 4-year colleges).

In order to sit for the more advanced Installer Certification Exam, one must have been the lead installer for two PV systems and have received at least 40 hours of advanced PV training. The training can come from a variety of sources including community colleges or universities, independent training providers with ISPQ (Institute for Sustainable Power Quality) accreditation, apprenticeship training programs, vocational/technical schools, or industry in-house training programs.

U.S. Green Building Council. The U.S. Green Building Council (USGBC) is a nonprofit organization with a goal of making green buildings available to everyone within a generation. To that end, the USGBC administers the Leadership in Energy and Environmental Design (LEED) certification program, a rating system that assesses the environmental sustainability of new and existing buildings.

In evaluating the level of energy and environmental design of a building, according to the council's website, LEED "…provides independent, third-party verification that a building project meets the highest green building and performance measures."[56]

The LEED rating system has a maximum of 69 possible points, with more points signifying increasingly more green features. Buildings are certified as follows:

1. base certification 26-32 points;
2. silver certification 33-38 points;
3. gold certification 39-51 points; and
4. platinum certification 52-69 points.

[56] http://www.usgbc.org. (November 2009).

Some of the points given to buildings (or communities) depend on the extent to which buildings are designed and built to improve:

- energy savings;
- water efficiency;
- carbon dioxide (CO_2) emissions reduction;
- indoor environmental quality; and
- stewardship of resources and sensitivity to their impacts.

A list of the 42 Connecticut buildings with LEED certification as of November 2009 is found in Appendix K. Many of the buildings are located on the campuses of boarding schools or colleges; there are also supermarkets and large corporations on the list.

Additionally, the U.S. Green Building Council certifies LEED professionals. The recently established LEED green associate credential is given in non-technical fields of practice to individuals who have demonstrated green building expertise by passing a USGBC exam. The LEED AP (advanced profession) certification is given to persons who have demonstrated advanced depth of knowledge in green building practices on a national exam and also have documented, professional experience on a LEED project within the last three years. As of November 2009, Connecticut had 29 people credentialed at the LEED green associate level and 1,214 credentialed at the LEED AP level.

The *Connecticut Green Building Council* is a state chapter of the U.S. Green Building Council. It is a nonprofit organization that promotes the construction of high performance energy efficient buildings in Connecticut. Efforts include:

- holding a series of workshops on green building topics;
- maintaining a speaker's bureau, and sponsoring educational forums and seminars on green building; and
- periodically offering Connecticut-based LEED training in cooperation with the U.S. Green Building Council.

Developing the Green Collar Field and Future Job Opportunities

Who is developing the green field? In addition to *driving* the green movement and *defining* green collar jobs, the third "D" is *developing* the green collar field and future job opportunities. The promotion and development of the green collar field by several state agencies, business associations, and private companies is now discussed.

Role of state workforce development agencies in developing the green collar field. *There are many state agencies and private organizations working on green collar job initiatives in Connecticut.* In part because of federal requirements pertaining to ARRA grant submissions,

there are consortiums and partnerships currently being formed or shaped, often expanding to include more key stakeholders. While these agencies and organizations have many responsibilities, Table VII-11 focuses on each state agency's role in developing green collar job opportunities in Connecticut, either directly or indirectly.

Roles of other organizations in developing the green collar field. Besides the entities just described, there are other organizations that play a role in developing green collar job opportunities in Connecticut. The *Connecticut Business and Industry Association* (CBIA), for example, representing 10,000 Connecticut companies, has staffed the aforementioned Energy Workforce Development Consortium and established an Environmental Policies Council to connect businesses with environmental experts, regulators, and state and federal policymakers. The association has also developed a virtual Green Business Center that features green vendors, news, best practices, and incentives for CBIA member companies. The CBIA Education Foundation has helped design curriculum for Hartford High School's Academy of Engineering and Green Technology.

The Connecticut Business and Industry Association also periodically surveys members regarding sustainability and green business practices. In the most recent survey, CBIA found 73 percent of respondents reported engaging in green/sustainable practices in 2009, a sharp increase from the 59 percent in 2008 and 47 percent in 2007.

Some of *Connecticut's companies* play a role in developing green collar job opportunities. United Technologies Corporation, solar panel companies, and fuel cell companies, among others, are generating green jobs as their businesses expand, due in part to ARRA funds and state tax and other incentives. FuelCell Energy, Inc. of Danbury, for example, was recently awarded $1.5 million by the U.S. Department of Defense[57] to continue development of its electrochemical hydrogen separator, which has industrial and transportation applications. Apollo Solar of Bethel was awarded $1.5 million by the U.S. Department of Energy to develop commercial-ready solar power technology for development of nationwide solar energy grid integration systems.

Where will future green collar job opportunities be? The Connecticut DOL estimated the current and projected number employed in various green occupations. Of all the green occupations examined, only the demand for nuclear engineers and power plant operators is expected to decline during the next decade (Table VII-12).

[57] U.S. Department of Defense Engineer Research and Development Center's Construction Engineering Research Laboratory.

Table VII-11. Roles of State Agencies in Developing Green Collar Job Opportunities in Connecticut	
State Agency	**Role(s)**
Connecticut Department of Labor	• Plays key role in projecting numbers employed currently and in the future green collar workforce • Recently approved U.S. DOL grant will allow CT DOL to work with neighboring states to identify job vacancies and green collar jobs in greatest demand • Work with Workforce Investment Boards to obtain training for under- and unemployed individuals, particularly in weatherization installation, energy audit field • Establishment of a 21st Century Green Jobs Training Initiative, which shall provide training to meet the needs of the energy industry and other green industry
Connecticut Office of Workforce Competitiveness	• Manages and staffs Connecticut Employment and Training Commission and its Connecticut Energy Sector Partnership (formerly Green Jobs Council), charged with developing green job opportunities and establish training programs • Soon to be established Green Science and Engineering Advisory Group to develop strategies for introducing green principles into education, manufacturing, engineering, and other aspects of business and industry, and to leverage resources available to Connecticut through its universities • Provide administrative support and coordinate efforts among state agencies, public and private colleges and universities, and quasi-public agencies whose missions relate to green collar industries and jobs
Connecticut Office of Policy and Management	• Energy division has key role in securing the ARRA green funds • May reallocate existing job training funds within the Secretary's discretion, to the new 21st Century Green Jobs Training Initiative
Department of Social Services	• Designated to receive U.S. Department of Energy block grants for weatherization • Operates the Weatherization Assistance Program (WAP), the purpose of which is to help low-income residents reduce their energy bills by making their homes more energy efficient. Weatherization is performed through the CAP agencies.
Department of Economic and Community Development	• Gives priority to projects incorporating clean and green energy through its awarding of monies from the Small Manufacturers Competitiveness Fund • Under contract with CCEF, conducted an economic and fiscal impact analysis of the renewable energy and energy efficiency industry group on the state's economy
State Department of Education	• Planning currently underway to create a Green Collar Corps • Purpose is to teach primarily high school students the skills needed to help their communities decrease their environmental and energy footprint • The Corps will be trained to conduct residential and commercial energy audits • Priority will be given to the enhancement and expansion of the technical high school system's model green jobs programs
Connecticut Innovations, Inc.	• Expand the Accelerator at Science Park to include green technology companies
Department of Transportation	• In consultation with DECD and DAS, develop a plan to implement a green transportation corridor along interstate routes 91 and 95 • The plan will find opportunities to require green improvements, including use and distribution of alternative energy sources along the green transportation corridor
Dept. of Env. Protection	• Develop a plan for the installation of green technology at all state parks
Source: PRI staff analysis	

Table VII-12. Growth in Connecticut's Green Occupations			
Occupation	**Estimated Number Employed in 2006**	**Projected Number Employed in 2016**	**Demand**
Hydrologist	97	121	↑25%
Geoscientist	174	209	↑20%
Environmental Engineer	747	891	↑19%
Environ. Science & Protection Tech.	392	458	↑17%
Environmental Engineering Technician	216	248	↑15%
Natural Sciences Manager	933	1,062	↑14%
Water & Liquid Waste Treatment Plant & System Operator	856	955	↑12%
Environ. Scientist & Specialist	685	761	↑11%
Nuclear Power Reactor Operator	108	113	↑5%
Nuclear Technician	195	197	↑1%
Nuclear Engineer	339	335	↓1%
Power Plant Operator	175	169	↓3%
Other[a]	576	629	↑9%
Total	**5,493**	**6,148**	**↑12%**

[a]Includes agricultural engineers, soil and plant scientists, zoologists and wildlife biologists, conservation scientists, and foresters.
Source: Office of Research, Connecticut Department of Labor, December 2008 Economic Digest

Another source of projections, the Advanced Technology Environmental and Energy Center,[58] predicts most green collar job opportunities to be in:

- building and selling energy-related products;
- energy efficient building construction;
- building energy assessment;
- building operations and maintenance;
- project engineering and implementation;
- energy transmission and distribution; and
- transportation systems and services.

Lastly, a recent Connecticut job-training grant application[59] prepared by the Connecticut Energy Training Partnership, projected the following annual openings in key energy efficiency and renewable energy sectors:

- energy-efficient building, construction, assessment, and retrofit (2,775 jobs);
- deconstruction and materials use (2,124 jobs);

[58] The Advanced Technology Environmental and Energy Center (ATEEC) is a national center that promotes and supports environmental and energy technology education to address the needs of the national and global workforce.
[59] *EnergizeCT! A Statewide Energy Training Partnership*, submitted to the U.S. Department of Labor.

- environmental protection/clean water (occupations include carpenters, electricians, glaziers, maintenance/repair, ironworkers, finishing trades, laborers, environmental technicians) (1,683 jobs);
- solar and wind (2,065 jobs);
- fuel cell (493 jobs); and
- biofuels (occupations include electrical and electronics, environmental and chemical technicians, and advanced manufacturing) (306 jobs).

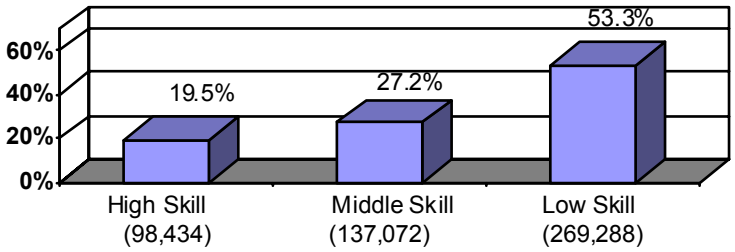
Delivering Education and Training for Green Collar Jobs

Until now, this chapter has described the forces *driving* the green movement, the many *definitions* of green collar jobs, and the players involved in *developing* the green collar field and future job opportunities. The fourth "D" of the green collar field is *delivering* education and training for green collar jobs. The various training programs resulting from ARRA stimulus funds are providing existing workers with additional green skills and knowledge, and sometimes additional credentialing or certification. The ARRA funds are also providing unemployed and underemployed people with entry level jobs in such areas as weatherization and green construction.

All public postsecondary education institutions, many independent colleges and proprietary schools, and the technical high schools play a role in delivering education and training individuals for green collar jobs. *Although there is no consensus on the definition of green jobs, the occupations discussed in this chapter require a range of education and training levels, from less than a high school diploma to a graduate degree.* While the focus of the PRI study is on jobs requiring postsecondary education, career ladders and lattices are an important aspect of the continuum of green collar jobs. Therefore, a discussion of certain green collar occupations requiring on-the-job or other (non-college) training is also included.

Using the Connecticut Department of Labor comprehensive working definition of green occupations, which lists 119 green occupations including lawyers, janitors, and roofers, Figure VII-3 shows *approximately one in five green collar jobs requires a bachelor's degree or higher* (high skill level) and *one-quarter either an associate's degree, postsecondary vocational training, or long-term on-the-job training* (middle skill level). *Over half* of the green collar jobs, however, *do not require any postsecondary education or extensive on-the-job training* (low skill level).

Figure VII-3. Educational and Skill Level of Green Collar Jobs



Source: CT DOL Occupations in a Green Industry Report, April 2009

Because the entry level job salaries are often unable to support a family, *these low skill level jobs can be viewed as part of a career ladder or lattice*, where continuing education, training, and experience lead to financially adequate jobs. Further, while much of the explosion of weatherization jobs is being driven by ARRA funding, it is possible that demand for weatherization jobs will decrease as federal funding is withdrawn. Thus, career ladders and lattices play an increasingly important role in the green energy field.

Green collar career ladders and lattices. Figure VII-4 summarizes the green collar educational continuum and the roles various state institutions and agencies may play in the preparation of the green collar workforce. Although not included in this diagram, independent colleges, nonprofit agencies, businesses, and others also play a role in the preparation of the green collar workforce. The roles of the many partners in this effort are described later in this chapter.

Career ladders and lattices are made up of a group of related jobs that comprise a career. Figure VII-5 shows an example of a possible green collar career ladder. Many of the entry-level positions are in the weatherization field. With the recent Connecticut Department of Social Services' $64 million grant from the U.S. Department of Energy for the Weatherization Assistance Program, that trend will continue. Thus, someone starting out may enter the green collar field with a position as a weatherization worker at a wage averaging $12-$14.70 per hour, depending on the county within Connecticut,[60] and with further education, advance to an energy auditor, earning approximately $31.25 per hour. While career ladders lay out a series of advancing jobs within a given industry, career lattices offer workers the flexibility of taking jobs either within the same industry or in a different industry. The education required and average salaries for some of the new and emerging green collar occupations are provided in Appendix L.

Near future workforce supply. Initiatives to train Connecticut's green collar workforce are occurring at Connecticut's public community college system, state college system, and the University of Connecticut. Independent postsecondary education institutions are also involved in the training of Connecticut's green collar workforce, as are the technical high schools, Connecticut Clean Energy Fund, for-profit institutes, unions, and national training organizations.

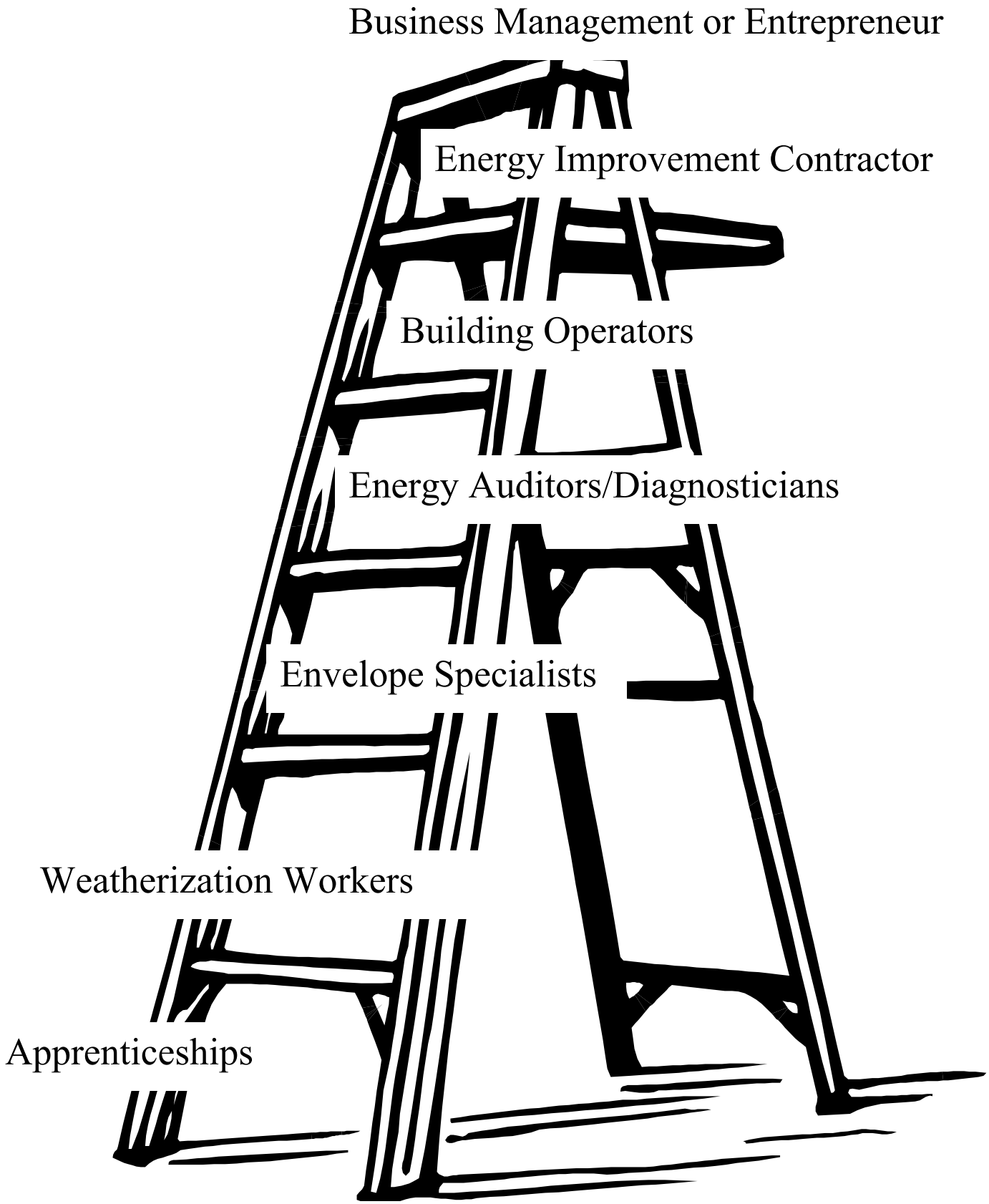
Beyond traditional students, there are current members of the workforce taking courses or obtaining certificates to enhance skill sets with green knowledge and technology. As noted earlier, two of the three green collar job categories defined by the U.S. DOL pertain to existing occupations conducted within a green setting; and existing occupations requiring additional green skills and knowledge. Occupations in the first category (that require postsecondary education) are already being offered at colleges. Occupation in the latter category may simply require supplementary college courses, or green applications within existing college courses.

[60] The Davis-Bacon Act requires Connecticut and other states receiving ARRA funds to pay prevailing wages for various weatherization-related jobs.

Figure VII-4. Green Collar Educational Continuum

Source: Institute for Sustainable Energy at Eastern Connecticut State University

Figure VII-5. Potential Green Collar Career Ladder



Source: *Building a Green Collar Workforce, The Institute for Sustainable Energy at Eastern Connecticut State University*

There are students currently in college preparing for specific green collar occupations. Table VII-13 identifies Connecticut postsecondary education institutions singled out by Navigant Consulting, Inc., as having employees engaged directly in EE/RE postsecondary teaching and/or research.

Table VII-13. Higher Education Institutions with Employees Engaged Directly in EE/RE Research and/or Postsecondary Teaching

Institution	Type
Manchester Community College	Public community college
Three Rivers Community College	Public community college
Naugatuck Valley Community College	Public community college
Central Connecticut State University	Public four-year state university
Eastern Connecticut State University	Public four-year state university
University of Connecticut at Storrs	Public land-sea-grant university
Fairfield University	Independent university
Saint Joseph College	Independent university (college)
Quinnipiac University	Independent university
University of Bridgeport	Independent university
University of Hartford	Independent university
Yale University	Independent university

Source: *Connecticut Renewable Energy/Energy Efficiency Economy Baseline Study Phase 1*, March 27, 2009, Navigant Consulting, Inc.

Overall, the higher education institutions are contributing to creation of the near future green collar workforce in one of five ways:

1. offering majors or minors in directly related fields such as environmental science or environmental engineering;
2. offering majors or minors associated with the green movement;
3. establishing centers or institutes directly related to renewable energy, energy efficiency, or other green areas;
4. offering certificates in green collar fields; and
5. offering individual courses to add green collar skills and/or knowledge.

A description is now provided of each of these the kinds of efforts.

1) Offering "environmental" majors. Table VII-14 shows the 16 Connecticut colleges with an environmental major, such as environmental studies, environmental science, and forestry or environmental studies, and the number of degrees conferred. A minor in one of these environmental areas is offered by many of the 16 colleges and also other higher education institutions not offering an environmental major. Both Eastern and Southern Connecticut State Universities, for example, offer both majors and minors in environmental earth science.

There may also be multiple colleges within a university offering environmental majors or minors. The University of Connecticut, for example, has students in the colleges of agriculture and natural resources, engineering, and liberal arts and sciences, all studying fields with a

Table VII-14. Number of Degrees Awarded in 2007-2008 in "Environmental" Programs			
College	**Degree Type**	**Program Name**	**Number Awarded**
Connecticut College	Bachelor's Bachelor's	Environmental Chemistry Environmental Studies	1 15
Eastern CSU	Bachelor's	Environmental Earth Science	11
Gateway CC	Associate's	Environmental Science & Toxicology	1
Middlesex CC	Associate's Associate's	Environmental Science Environmental Science: Biotechnology	2 5
Naugatuck Valley CC	Associate's	Environmental Science: Biology	3
Sacred Heart University	Bachelor's	Environmental Science	3
Saint Joseph College	Bachelor's	Environmental Science	1
Southern CSU	Master's	Environmental Education	11
Three Rivers CC	Associate's	Environmental Engineering Technology	3
Trinity College	Bachelor's	Environmental Science	6
UConn	Doctorate Master's Bachelor's Bachelor's	Environmental Engineering Environmental Engineering Environmental Engineering Environmental Science	1 6 4 19
University of Hartford	Master's	Environmental Engineering	5
University of New Haven	Master's Master's Bachelor's	Environmental Engineering Environmental Science Environmental Science	12 3 1
Wesleyan University	Master's Bachelor's	Earth & Environmental Studies Earth & Environmental Science	3 12
Western CSU	Master's	Biological & Environmental Sciences	5
Yale University	Bachelor's Master's Doctorate Bachelor's Master's Doctorate	Engineering Science-Environmental Engineering Environmental Engineering Environmental Engineering Environmental Studies Forestry & Environmental Studies Forestry & Environmental Studies	3 13 5 9 121 5
TOTAL			289
Source: Connecticut Department of Higher Education Degree Completion Database			

primary focus on the environment (e.g., environmental engineering, environmental science). Striking growth was seen in the environmental major in the College of Agriculture and Natural Resources, where there was a 75 percent increase in the number of environmental science majors from fall 2008 (36 students) to fall 2009 (63 students).[61]

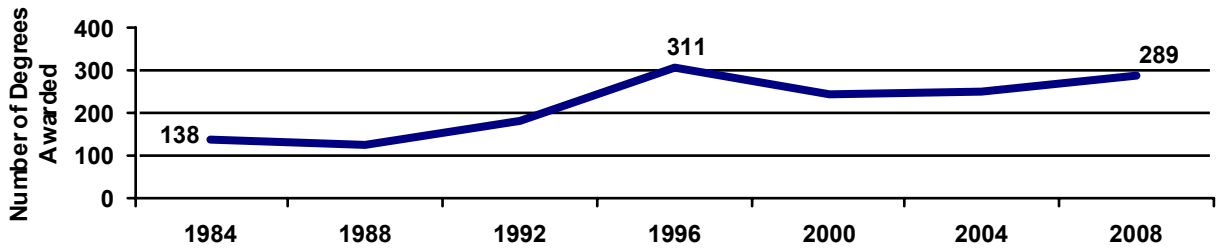
[61] *University of Connecticut Green Research, Outreach and Academic Programs*, report prepared by the University of Connecticut for the Legislative Program Review and Investigations Committee (October 2009).

As shown in Table VII-14, Trinity College recently reported[62] having added a new major in environmental science, and Goodwin College reported adding an associate degree in environmental science, and certificates in:

- brownfield remediation;
- riverine ecology;
- water distribution operations;
- water treatment operations; and
- environmental health technician.

On the other hand, in the same recent survey, Sacred Heart University and Saint Joseph College both reported discontinuation of the bachelor degree in Environmental Science due to declining/low student enrollment (see Appendix M for a summary of the CCIC survey results). *Overall*, however, *there has been an increase in the number of environmental degrees conferred, particularly in comparison to the number of such degrees awarded in the 1980s* (Figure VII-6).

Figure VII-6. Number of "Environmental" College Degrees Awarded



Source: CT Department of Higher Education Degree Completion Database

2) Offering majors or minors associated with the green movement. Beyond the limited number of "environmental" majors, there are a variety of other majors that are considered green, depending on the person or organization making the determination. Regardless of whether the major is considered green, as has been discussed previously in this chapter, a green component has been added to many other majors. The California Community Colleges Centers of Excellence in Economic and Workforce Development believe there are few specific new programs for green jobs, such as technical level jobs for specific trades (i.e., wind, solar, geothermal) that need to be created. The centers instead recommend that colleges embed a green curriculum or green thread throughout all courses.[63]

Some of the majors frequently considered green or associated with the green movement by the Institute for Sustainable Energy at Eastern Connecticut State University include:

[62] Connecticut Conference of Independent Colleges Survey for the PRI Study of the Alignment of Postsecondary Education and Employment, July 2009.
[63] *Understanding the Green Jobs: Tools and Resources*, California Community Colleges Centers of Excellence Economic and Workforce Development.

- marine biology, marine chemistry, maritime studies, and coastal studies;
- landscape architecture, ornamental horticulture and turf grass management;
- geology;
- chemical engineering, civil engineering, electrical engineering, and mechanical engineering;
- forest science;
- meteorology;
- environmental economics; and
- construction management, and energy management and policy.

3) Establishing centers or institutes directly related to renewable energy, energy efficiency, or other green areas. Centers or institutes directly related to the environment, renewable energy, energy efficiency, or other green areas are found within every Connecticut college system. A description of each now follows.

Institute for Sustainable Energy at Eastern Connecticut State University. Established by the Board of Trustees of the Connecticut State University System in 2001, the Institute for Sustainable Energy at Eastern Connecticut State University is a cornerstone of the green initiative. The institute focuses on matters relating to energy education, energy policy, energy efficiency, energy conservation and load management, renewable energy, distributed generation, protection of environmental resources, and the dissemination of information on energy alternatives and sustainability to users and providers of energy. The mission of the institute is "…to be an objective energy and educational resource regarding the means for achieving a sustainable energy future for Connecticut."[64]

Staffed by a director, educational and technical specialists, and an assistant, more than a dozen ECSU students obtain exposure and real world experience in the green field each year. The institute's educational efforts have included development of an educational website called Connecticut Energy Education (www.ctenergyeducation.com). This site contains information for educators featuring the energy topics in the Connecticut high school curriculum. Building Inspector Energy Code Standards Training is also offered by the institute.

The Center for Clean Energy at the University of Connecticut. The University of Connecticut trains students for green collar careers and also conducts research in its Center for Clean Energy. Formerly called the Connecticut Global Fuel Cell Center, the center recently changed its name to reflect a larger scope of interest that encompasses emerging energy technology areas such as biofuels, coal gasification, natural resource conservation, power management, and smart power transmission. As announced on the center website (www.ctfuelcell.uconn.edu), this expansion is expected to leverage the center's "…core strength and leadership in the field of advanced fuel cell technologies and power generation systems and enables our students and faculty to better address the global energy and environmental needs."

[64] http://www.easternct.edu/sustainenergy/about_us/mission_statement.html (November 2009).

The Center is operated by the University of Connecticut School of Engineering, and has recently added a new director and six faculty members. The center partners with and/or is funded by the U.S. Departments of Energy and Defense, the National Science Foundation, the Connecticut Clean Energy Fund, UTC Power and Proton Energy Systems, and others. Students have the opportunity to learn about the green field through research with center faculty.

Center for a Sustainable Future at Gateway Community College. Established in 2009, the Center for a Sustainable Future at Gateway Community College offers courses in sustainable operations. Providing hands-on practical skills training, certificates are offered in solar energy technologies (completed by 78 students to date) and alternative energy transportation. Building performance certificates and clean water treatment plant classes are also offered. According to its website, the Center is positioning itself to prepare the in-state green workforce of the future, taking an integral role in "…the sustainable economic development of the State of Connecticut, facilitating the transition to renewable energy sources, sustainable building development, energy efficiency programs, alternative transportation technologies, water management, and numerous other sustainable initiatives."[65]

Clean Energy Institute at the University of Hartford. The Clean Energy Institute is a branch of the University of Hartford, Engineering Applications Center. Involving five full-time faculty with experience in both academia and industry, two part-time faculty from local industries, and six undergraduate and graduate students, the institute is currently working on energy-related projects that include:

- parabolic solar collector;
- development of solid absorbents for the capture of greenhouse gasses;
- use of biodiesel fuel in a university bus;
- design and testing of passive coolant devices for photovoltaic cells;
- comparison between predicted and measured power and a series of photovoltaic array; and
- novel ejector/condenser to compress vapor in liquid/vapor air conditioner.

4) Certificates in green collar fields. As described earlier, several approved and pending ARRA grants are expected to help unemployed and underemployed workers earn certificates in emerging green collar fields. In anticipation of those opportunities, and demand for such certificates from businesses and students, there are several certificate programs currently underway at some of the community colleges (see Appendix N for a comprehensive list of green certificates (and degrees) offered at each of the Connecticut community colleges). Also, two- and four-year colleges are considering including the earning of one or more certificates as an option for students enrolled in related associate and bachelor degree programs. Table VII-15 shows the number of initial community college students who were enrolled or awarded a certificate in an environmental or green program in 2007-2008.

[65] http://www.gwcc.commnet.edu/uploadedFiles/Corporate_and_Continuing_Education/CSF%20Credit%20Course%20Fall%2009%20Schedule.pdf. (November 2009).

Table VII-15. Number of Students in 2007-2008 Enrolled or Awarded Certificates in "Environmental" Programs			
College	**Certificate Name**	**Number Enrolled**	**Number Awarded**
Gateway CC	Wastewater Management	1	0
Gateway CC	Water Management	10	3
Gateway CC	Alternative Fuel Vehicle	1	1
Naugatuck Valley CC	Advanced Wastewater	1	0
TOTAL		13	4
Source: Assistant Chancellor of Connecticut Community College System			

Due to state plans and federal stimulus funding, the figures are expected to rise significantly. Table VII-16, for example, shows the green certificate programs, including those under development, at particular community colleges as part of the federal grant, SOAR. With the exception of the Three Rivers Community College certificate programs begun in the fall 2009 semester, the certificate programs are anticipated to begin in the spring 2010 semester.

Table VII-16. Green Certificate Programs Under Development at Connecticut Community Colleges as Part of U.S. Department of Labor Grant, Project SOAR	
Community College	**Certificate**
Three Rivers Community College	• Sustainable Facilities Management • Sustainable Landscape Ecology & Conservation Technician
Norwalk Community College	• Building Efficiency & Sustainable Technologies Certificate/Sustainable Facilities Management
Gateway Community College	• Alternative Energy Transportation • Clean Water Treatment • Solar Energy Technologies
Naugatuck Valley Community College	• Alternative Energy Systems
Manchester Community College	• Sustainable Energy Certificate
Source: USDOL Community-Based Job Training Grant, *Sustainable Operations: Alternative and Renewable (SOAR) Energy Initiative*, Award Period: 2/15/09-2/14/12	

Features of the SOAR grant-funded certificate programs include: enhanced learning technology; increased instructional supports; tuition assistance; tutoring; and academic and career counseling. The Sustainable Landscape Ecology & Conservation Technician certificate, for example, requires 24-24.5 credits, usually taken over two semesters. The objective of the certificate is to provide students with entry-level skills needed to fill technician jobs in the areas of sustainable landscape design, planning, and conservation.

Many current Three Rivers Community College students studying for an associate's degree in environmental engineering technology have expressed interest in obtaining a sustainable landscape ecology and conservation technician certificate, which would be achieved through completion of three additional courses. In developing career ladder opportunities, the

program coordinator has been working with representatives of the University of Connecticut College of Agriculture to accept the Three Rivers Community College courses for students wishing to transfer and obtain a bachelor's degree in either Plant Sciences or Natural Resources and the Environment.

5) Individual courses to add green collar skills and/or knowledge. For workers interested in learning about this emerging field, individual green credit and noncredit courses are available at many Connecticut postsecondary education institutions. *Community colleges in particular play an important function in availing the current workforce of green courses needed to enhance existing skill sets.* A full listing of green credit and noncredit courses offered at each of the community colleges is found in Appendix O for fall 2007 through fall 2009. Courses offered include:

- introduction to environmental science;
- environmental regulations;
- greenhouse management;
- water resources engineering;
- sustainable energy and the environment;
- principles of ecology; and
- alternative building systems.

Enrollment in the community college introduction to environmental science for-credit course has more than doubled in the past two years, from 212 students in fall 2007, to 447 students in fall 2009. While some students may be considering green certificates or degrees, it can be assumed that many of the part-time students are accessing the courses to improve or "green" current skills in the workplace.

Efforts by Connecticut's technical high schools. Preparation for green collar jobs is underway at the Connecticut technical high schools, including training on installing electricity-producing wind turbines. Recently, E.T. Grasso Technical High School in Groton graduated 13 students from its bioscience and environmental technology program, and a new facilities management program has been started at J.M. Wright Technical High School in Stamford.[66] The technical high schools are also working with the community colleges to develop career paths for related programs.

Other training efforts. As described earlier, the Connecticut Clean Energy Fund Board of Directors recently approved funding for expansion of the Learning for Clean Energy Innovation program within the Connecticut technical high school system. The program will build the capacity to train students for clean energy jobs, focusing on solar photovoltaic and solar thermal technologies, with the sharing of newly purchased equipment to be housed at three of the technical high schools (Wolcott, Grasso, and E.C. Goodwin). In addition to enabling seven high school teachers to be trained in green fields, funding has also been made available to tailor a related Massachusetts technical high school curriculum to Connecticut's needs. All electrical and

[66] The State Department of Education recently suspended operations at the J.M. Wright Technical High School in Stamford for two years in order to study options for restructuring.

plumbing students at the three schools will have this new green curriculum that will eventually be used at other technical high schools.

Besides the nonprofit public and independent institutions of higher education, there are also *for-profit institutes* that play a role in promoting and preparing the Connecticut workforce for green collar jobs. The Baran Institute of Technology (East Windsor), for example, offers an electrician certificate, diesel technology program certificate, and HVAC/Technology program certificate. Among the training offered by the Everblue Training Institute (Hartford) are LEED exam preparation and certification courses, solar training, wind training, and energy auditor training.

Other organizations that play a role in promoting and preparing Connecticut's workforce for green collar jobs are the *unions.* Several unions have apprenticeship programs in green collar fields including wire solar panels, wind turbines, and biofuel plants. For example, the International Brotherhood of Electrical Workers has developed green training curricula in the electrical industry that range from retrofitting buildings to installing wind turbines.

Lastly, there is a national energy council that has developed uniform guidelines and best practices for training in such areas as solar photovoltaic installation, which are applicable to training in either technical high schools or colleges. The *Interstate Renewable Energy Council* (IREC) is a national nonprofit organization that develops and promotes the use of uniform guidelines, competency standards, credentialing, best practices, and quality assessment for solar and other renewable energy professionals and training programs. IREC is currently promoting use of the Institute for Sustainable Power Quality (ISPQ) framework in its guidelines.

Through the accreditation of training programs and certification of trainers, IREC ensures that a national framework of standards and metrics is adhered to, covering curriculum, training equipment, and teacher qualifications for both face-to-face and online courses. There are currently no ISPQ accredited training programs in Connecticut and no applications for ISPQ accreditation under audit.

Model for Aligning Supply and Demand for Green Collar Jobs

The Rutgers University John J. Heldrich Center for Workforce Development recently identified key elements of an effective green jobs talent network.[67] Table VII-17 shows four components of an effective talent network. This model will be referred to in the following discussion of potential barriers to alignment in the green collar jobs area when applicable.

What are Some Possible Barriers to Alignment in the Green Collar Jobs Area?

As described in the briefing report, there are several possible barriers to the alignment of postsecondary education and employment. This chapter focuses on several possible barriers to alignment in the *green collar jobs area*. The barriers discussed relate to: 1) elementary and secondary school students in the knowledge/talent pipeline; 2) postsecondary education institutions; 3) difficulty in making accurate demand predictions; 4) current economic challenges; and 5) state agency organization, programs and policies. Each is now briefly discussed.

[67] John J. Heldrich Center for Workforce Development Research Brief, *Preparing the Workforce for a "Green Jobs" Economy* by Jennifer Cleary and Allison Kopicki, February 2009.

Table VII-17. Model for Aligning Supply and Demand for Green Collar Jobs		
1.	Identify Assets	• Create inventory of public and private assets • Identify existing training opportunities • Chart funding streams available to support green job growth and training efforts
2.	Cultivate Career Pathways	• Support low-skilled, low-income workers to move into higher-skilled jobs that pay better wages through education and green jobs training • Ensure that training results in a nationally recognized credential • Focus on accreditation of training programs and creating "stackable" credentials through articulation agreements
3.	Align Green Jobs Workforce Training Efforts with Economic Development Initiatives	• Establish a connection between attracting green energy businesses and customized training, hiring and recruitment systems
4.	Do Not Duplicate Training or Curricula	• Ensure that workers in multiple locations have access to training that is relevant to employers by developing mechanisms to share curricula that result in credentials that are in high demand by employers • Consider developing centralized training centers that provide students with the opportunity to get hands-on training using state-of-the-art equipment
Source: Rutgers University John J. Heldrich Center for Workforce Development		

Barriers related to elementary and secondary school students. *Lack of awareness or understanding of what green collar jobs are* is one possible barrier related to elementary and secondary school students, parents, teachers, and guidance counselors. Because this is an emerging field and there is no consensus on what constitutes a green job, confusion is understandable.

The U.S. Department of Labor taxonomy is a useful tool to understand the categories of occupations in a green economy (i.e., green *increased demand* occupations, green *enhanced skills* occupations, and green *new and emerging* occupations). Additionally, the categorization of green occupations into *energy efficiency* and *renewable energy* may also be useful to understanding how the various jobs fit together. Therefore, until something more definitive is provided by the U.S. DOL or Connecticut DOL, the **program review committee recommends:**

> **Wherever possible, the U.S. Department of Labor taxonomy and EE/RE categorization should be incorporated into explanations of green collar jobs.**

Barriers related to postsecondary education institutions. As new certificate programs are developed, it would be useful to standardize the name of identical certificate coursework across all public colleges. This will allow for articulation agreements to be more easily developed and career ladders established. The cultivation of career pathways is one of the

elements specified in the Heldrich Center model for aligning supply and demand for green collar jobs.

The standardization of new green certificate programs will also help identify education and training resources available, promoting possible opportunities to share expensive equipment needed for some green instruction. This will promote the identification of assets, another element required in the Heldrich Center model for aligning supply and demand for green collar jobs.

Currently, certificates requiring the same coursework may have different names, depending on the particular community college. To help identify the current training available and determine in the future whether more or less of such training would be needed by the Connecticut workforce, the **program review committee recommends that:**

> **The Connecticut Community College System should implement uniform naming of green certificate programs across all member colleges.**

Because green efforts among the higher education institutions are occurring in a variety of degree and certificate programs, stand-alone courses, and centers/institutes, it is difficult to implement any of the four elements of the Heldrich Center model for aligning supply and demand for green collar jobs (i.e., identification of assets, cultivation of career pathways, alignment of green jobs workforce training efforts with economic development initiative, and not duplicating training and curricula unnecessarily). *Although CETC and the Connecticut Energy Sector Partnership are charged with developing and coordinating green collar job opportunities, neither is a central repository for the many initiatives emerging across higher education.* By regularly soliciting this information with the support of OWC staff, more comprehensive information may be made available to higher education, Connecticut DOL, and the many other members of the partnership to then share with their agencies and organizations. Efforts to align green collar jobs and employer needs may then be done more accurately and efficiently. Therefore, the **program review committee recommends that:**

> **The Connecticut Employment and Training Commission and the Connecticut Energy Sector Partnership should regularly solicit and make widely available information on green efforts occurring among the higher education institutions including new degree and certificate programs, stand-alone courses, and center/institute initiatives useful in the alignment of green collar jobs and employer needs.**

Barriers related to difficulty in making accurate demand projections. As is apparent throughout this chapter, green collar jobs are just emerging and the official federal occupational code system (O*NET) has not yet caught up with these green occupations. Indeed, a recent Connecticut Department of Labor publication noted that, "Green is ubiquitous, encompassing many areas of the economy. Some occupations are 'green' one day and may be only partially green the next."[68]

[68] CT Department of Labor Economic Digest, December 2008.

Until the green field has developed further, it will be difficult to make accurate demand projections. The recently awarded ARRA grant to the eight-state consortium, as described earlier, will address some of the challenges in making projections of demand for green jobs.

Barriers related to current economic challenges. As Connecticut and the rest of the country is faced with an economic recession, *there are few resources apart from ARRA stimulus funds to purchase the expensive equipment required to train students* in such fields as solar photovoltaic and thermal installation. With some grant funding available for several of the technical high schools to purchase such expensive equipment, *the education systems need to find ways to share resources.* Thus, a technical high school with such equipment, located near a community college, should find ways to make the equipment available to both student populations. Similarly, if a college had such equipment, it could be shared with technical high schools, and also other colleges. Therefore, the **program review committee recommends that:**

> **Educational systems should develop agreements to share equipment needed for students training for green collar jobs, such as solar photovoltaic installation.**

Additionally, *the influx of ARRA funds will not last forever, and plans should be made to continue successful initiatives beyond such temporary funding.* Entry level jobs in weatherization installation, for example, may be especially vulnerable, and career ladders and lattices should be active to train workers so they may remain employed and move into other positions. Therefore, the **program review committee recommends that:**

> **Connecticut postsecondary education institutions and state workforce development agencies should, wherever possible, support efforts to create career ladders and lattices in the green collar fields, particularly for those workers who gained entry into the system through temporary ARRA grant opportunities.**

Barriers related to state agency organization, programs, and policies. As was described in this chapter, *there are multiple agencies and organizations working on efforts in the green field*. To gather information on the many disparate activities occurring, the Institute for Sustainable Energy at Eastern Connecticut State University recently attempted to identify green majors and initiatives at primarily postsecondary education institutions, the technical high school system, International Brotherhood of Electrical Workers, and private training institutes. Such an inventory would be useful in conveying what green education and training is occurring, thereby improving efficiency by reducing unnecessary duplication and sharing limited resources, including courses, certificates, majors offered, and expensive green-related equipment. The Departments of Higher Education and Education would be in a good position to obtain such information through an annual inventory. The results of the inventory would be useful for planning purposes, and made available to all postsecondary institutions and technical high schools for potential opportunities to collaborate. Therefore, the **program review committee recommends that:**

The Departments of Higher Education and Education should prepare an annual cross-system list of green courses, and certificates and majors offered, and inventory of green-related equipment.

Multiple institutions and agencies lead to communication and coordination challenges. *Sometimes institutions are unaware of green efforts occurring within colleges in different higher education systems.* For example, during staff interviews, it was learned that representatives of the University of Connecticut (Storrs) were unaware of efforts underway at the nearby Institute for Sustainable Energy at Eastern Connecticut State University (Willimantic), and vice versa. With the University of Connecticut's recent efforts in the green field, particularly in the School of Engineering's Center for Clean Energy, human energy should be conserved, and mutually beneficial collaborations undertaken. Therefore, **the program review committee recommends:**

Staff from both the University of Connecticut Center for Clean Energy and the Institute for Sustainable Energy at Eastern Connecticut State University should meet at least quarterly to discuss possible ways to collaborate on green initiatives. Staff from other institutions and centers located within the same regions should also form partnerships and meet to develop collaborative efforts.

Chapter VIII

State Efforts to Address Workforce Shortage of Nurses

As part of the PRI committee's study on postsecondary education and alignment with employer need, the committee examined the strategies used to increase the number of nursing program graduates to address a serious nursing shortage that began in the late 1990s. Because the shortage had widespread public health implications and was projected to become increasingly worse, state policymakers and other stakeholders took several steps to address the issue. Many of the strategies implemented were successful and have resulted in the production of more nursing school graduates to meet employer needs. Similar strategies could be adopted for other state workforce shortage areas.

To explain the nursing shortage alleviation strategy, this chapter provides background information, describing nursing program enrollment, graduation, and licensure trends. It also discusses the roles of the statutorily-created Allied Health Workforce Policy Board (AHWPB) as a forum for stakeholders, building partnerships, serving as a centralized source of information regarding the various efforts, and proposing solutions on how to better align postsecondary nursing programs to produce more graduates.

Since the shortage was identified, several strategies have been adopted that have collectively increased the number of graduates of entry-level nursing programs. There were public advertising campaigns by postsecondary institutions that had nursing programs to increase awareness of nursing as a career. Scholarships and loan forgiveness programs were adopted by the legislature to encourage college students to enter nursing programs at every degree level, and to provide grants to colleges and universities to establish or expand their nursing programs. Targeted student advising, tutoring, and counseling were implemented in order to increase retention of students who were enrolled in nursing programs. Postsecondary institutions established collaborative partnerships with area hospitals that provided for hospital staff to serve as faculty for postsecondary nursing programs, offered scholarships, and provided clinical opportunities for students of nursing programs. Strategies that were implemented by one college or university were discussed by members of the AHWPB so that similar solutions could be implemented by other postsecondary institutions.

When Did Concerns Over a Shortage Begin?

Concerns over a national shortage of nurses were raised in the late 1990s and gained widespread attention over the next several years. Several reasons were cited for the nursing shortage, both nationally and in Connecticut, including: postsecondary students were no longer choosing nursing as a career and those who were had high program attrition rates; many licensed nurses only worked part-time or were working in other fields that did not involve the provision of direct client care; and the average age of licensed nurses was believed to be high (over 45 years old in Connecticut), indicating the shortage would become increasingly worse as older nurses retired within the next decade. Current concerns regarding whether a nursing shortage still exists include the aging of the overall population and the proposed expansion of health care to the uninsured or under-insured, which would boost demand for nursing care.

What was Connecticut's Initial Response to the Nursing Shortage?

Nursing shortage study. One of the first responses by the Connecticut General Assembly in responding to the potential crisis was the adoption of P.A. 00-216, which mandated the Department of Public Health commissioner to conduct a study concerning the state's shortage of nurses.[69] The study was to include an examination of the causes for the shortage of nurses in the state and recommendations to address the shortages. The legislation also required the study to examine the establishment of a uniform method to capture actual nurse-to-patient ratios in hospitals, long-term care facilities, and home health agencies, and make recommendations for supplementing nursing care in the state in response to the nursing shortage.

The 2000 report, issued by a contracted consulting group, noted that the "field of nursing has experienced recurrent cyclical shortages and surpluses over the past decades; fewer than ten years ago the supply of nurses was considered abundant, many institutions reduced their nursing work force by downsizing administrative nursing staff, and registered nurses were employed in positions formerly filled by licensed practical nurses (LPNs). Factors influencing the oversupply and staff reductions included the high unemployment rate within the country, reduced hospital stays, and the focus on cost containment within the healthcare system (e.g. managed care)."[70]

At the time of the shortage, the study cited the poor quality of available state data but using existing national and state survey information estimated the average age of RNs in Connecticut to be 46.5 years old with 60 percent of licensed RNs working full time; 23 percent part time; and 17 percent maintaining their license but not working in the nursing profession.

Study findings and recommendations. The study recommended that short- and long-term strategies be implemented, monitored and adjusted according to market demand. It identified the types of economic incentives that were considered to attract and retain nurses in direct patient care settings, including tuition reimbursement programs, loan forgiveness, scholarship opportunities, child care incentives, and tax relief programs.

The report concluded that the shortage Connecticut was experiencing resulted from a large number of licensed nurses not working in the nursing profession; the state had a sufficient number of licensed nurses to meet the healthcare needs of its population. It recommended efforts aimed at both getting nurses to stay in or re-enter the nursing profession, and increasing the number of graduates to replace nurses leaving the workforce.

What is the Current Supply of Licensed Nurses?

Department of Public Health. According to the Department of Public Health, there were 53,476 licensed RNs and 12,293 LPNs in Connecticut as of April 2009. At the time of the PRI review, demographic information on Connecticut's licensed nurses, such as average age or working status, was not available because information submitted on licensing applications was not electronically stored or manually compiled. Although DPH anticipates beginning an online licensure renewal option for nurses that will capture some demographic information by the end

[69] Funding of $250,000 was appropriated to support the costs of conducting a study of the nursing shortage.
[70] *Study Concerning the Shortage of Nurses and the Quality of Patient Care in Connecticut*, The Healthcare Decisions Group, Washington, D.C., December 2000.

of 2009, the department acknowledged that nurses will still be able to renew by submitting a mail-in form and, for these nurses, information will not be electronically captured.

Department of Labor. The Connecticut Department of Labor examines employment by occupation and projects future need. Table VIII-1 shows the number of nurses actually employed, ten-year projections of demand, net job growth, and total projected annual openings for RNs in Connecticut. In 2006, DOL estimated that 32,840 RNs were employed, much less than the 52,326 RNs reported by DPH to be licensed in 2006.

Table VIII-1. DOL Employment Projections for Registered Nurses 2000-2006

Base Year	Employment		Projected Job Growth		Total Estimated Average Annual Openings
	Actual Employment	10-year Projection	Net Job Growth	Percent Change	
2000	30,560	36,740	6,180	20.0	1,235
2002	31,360	36,610	5,250	16.7	1,181
2004	31,890	36,020	4,130	13.0	1,081
2006	32,840	38,560	5,720	17.4	1,114

Source: OLR Memo 2008-R-0444 (based on *DOL Connecticut's Industries & Occupations Forecast: 2003, 2005, and 2006*). Updated by PRI using *DOL 2008 projections Forecast for 2006- 2016*

The table shows that from 2000 to 2004, there were over 1,000 job openings projected annually for RNs even though 10-year job growth projections decreased each year. By 2006 however, both job openings and growth projections were expected to increase, with DOL projecting a 17.4 percent increase in employment from 2006 to 2016, and 1,114 estimated annual openings, on average, for RNs over the 10 years projected. The total number of annual openings shown in the last column in the table takes into consideration death and retirement rates.

The department also does similar projections for licensed practical nurses. Table VIII-2 shows there were 8,020 LPNs employed in 2006 and 9,070 job openings projected by 2016, an overall increase of 13 percent. When death and retirement are considered, DOL projected there would be 324 annual openings, on average, per year.

Table VIII-2. DOL Employment Projections for Licensed Practical Nurses 2000-2006

Base Year	Employment		Projected Job Growth		Total Estimated Annual Openings
	Actual Employment	10-year Projection	Net Job Growth	Percent Change	
2000	7,010	7,990	980	14.0%	278
2002	7,400	7,900	500	6.8%	208
2004	7,880	9,100	1,220	15.5%	294
2006	8,020	9,070	1,050	13.1%	324

Source: *DOL Connecticut's Industries & Occupations Forecast: 2003, 2005, and 2006*

Because of data limitations, many factors that influence the current and future supply of nurses – the age of nurses, the number that work full- or part-time, the types of workplace

settings in which nurses are employed, and the number providing direct patient care or employed by other industries, such as insurance – make determining the adequacy of supply problematic.

What Types of Postsecondary Nursing Programs Are There in Connecticut?

Connecticut law (C.G.S. Sec. 20-87a) states the "practice of nursing by a registered nurse is defined as the process of diagnosing human responses to actual or potential health problems, providing supportive and restorative care, health counseling and teaching, case finding and referral, collaborating in the implementation of the total health care regimen and executing the medical regimen under the direction of a licensed physician, dentist or advanced practice registered nurse." Seventeen colleges and universities in Connecticut offer nursing programs (see Table VIII-3). There are five types of educational paths to becoming a registered nurse:

- s diploma program offered by Bridgeport hospital;
- two year associate of science degree in nursing;
- four year bachelor's of science degree in nursing;
- an accelerated career entry program leading to a BSN for individuals already having a bachelor's degree in a non-nursing field; and
- a master of science in Nursing (MbEIN) for individuals without a bachelor's degree in nursing.

There are also programs that allow individuals who are already licensed as an RN with a diploma or associate degree to enter programs to earn a bachelor's degree in nursing, as well as master and doctorate programs. It is important to note that most of the master's degree programs are for individuals who already are licensed RNs and are earning advanced practice or specialty degrees, although some institutions now have an education focus for students who may want to become faculty. In addition to the RN programs identified in the table, LPN programs are offered by the technical high schools (in the adult division) and three proprietary schools, as described later in this chapter.

Table VIII-3. Connecticut Postsecondary Schools with Nursing Degrees

College or University	Town	Program	Degree Level
Public Colleges and Universities			
Capital Community College	Hartford	Nursing	Associate of Science
Gateway Community College	New Haven	Nursing	Associate of Science
Bridgeport Hospital School of Nursing - graduates can enroll at Housatonic Community College	Bridgeport	Nursing Nursing	RN Diploma program Associate of Science
Naugatuck Valley Community College	Waterbury	Nursing	Associate of Science
Norwalk Community College	Norwalk	Nursing	Associate of Science
Three Rivers Community College	Norwich	Nursing	Associate of Science
Central Connecticut State University	New Britain	Nursing (RN to BSN)	Bachelor of Science in Nursing
		Nursing	Bachelor of Science in Nursing
		Nursing	Master of Science (Biological Sciences: Nurse Anesthesia)

Table VIII-3. Connecticut Postsecondary Schools with Nursing Degrees			
College or University	**Town**	**Program**	**Degree Level**
Southern Connecticut State University	New Haven	Nursing	Bachelor of Science in Nursing
		Nursing (RN to BSN)	Bachelor of Science in Nursing
		Nursing (accelerated career entry program)	BSN
		Nursing	Master of Science in Nursing – Clinical Nurse Leader Family Nurse Practitioner
		Nurse Practitioner	Graduate Certificate
Western Connecticut State University	Danbury	Nursing	Bachelor of Science
		Adult Nurse Practitioner	Master of Science in Nursing
		Nursing	Master of Science in nursing
		Post-Master's Adult Nurse Practitioner	Certificate of Advanced Studies
University of Connecticut	Stamford	Master's Entry into Nursing (MbEIN)	Graduate Certificate
	Storrs	Nursing	Bachelor of Science
		Master's Entry into Nursing (MbEIN)	Graduate Certificate
		Nursing Practice	Doctor of Nursing Practice
	Waterbury	Master's Entry into Nursing (MbEIN)	Master of Science in Nursing
	West Hartford	Nursing	Master of Science in Nursing
Independent Colleges and Universities			
Fairfield University	Fairfield	Nursing	Bachelor of Science in Nursing
		Nursing (RN to BSN)	Bachelor of Science in Nursing
		Nursing (accelerated career entry program)	Bachelor of Science in Nursing
		Advanced Practice Nursing	Master of Science in Nursing
Goodwin College	East Hartford	Nursing	Associate of Science
		Nursing (RN to BSN)	Bachelor of Science in Nursing
Quinnipiac University	Hamden	Nursing	Bachelor of Science in Nursing
		Nursing (accelerated career entry program)	
		Nursing	Master of Science in Nursing
		Nursing: Adult Nurse Practitioner	Master of Science in Nursing
		Nursing: Family Nurse Practitioner	Master of Science in Nursing
		Nursing: Forensic Nursing Clinical Specialist	Master of Science in Nursing
Sacred Heart University	Fairfield	Nursing (RN to BSN)	Bachelor of Science
		Nursing	Bachelor of Science
		Patient Care Services Administration	Master of Science in Nursing
		Family Nurse Practitioner	Master of Science in Nursing
		Clinical Nurse Leader	Master of Science in Nursing
		Family Nurse Practitioner	Sixth Year Certificate
St. Joseph College	West Hartford	Nursing	Bachelor of Science
		Nursing	Master of Science
St. Vincent's College	Bridgeport	Nursing	Associate of Science

Table VIII-3. Connecticut Postsecondary Schools with Nursing Degrees			
College or University	**Town**	**Program**	**Degree Level**
University of Hartford	West Hartford	Nursing (RN to BSN)	Bachelor of Science in Nursing
		Nursing & Organizational Behavior	Master of Science in Nursing (concentrations: teaching, management, community/public health
Yale University	New Haven	Nursing	Master of Science in Nursing
		Nursing	Sixth Year Certificate
		Nursing	Doctor of Philosophy

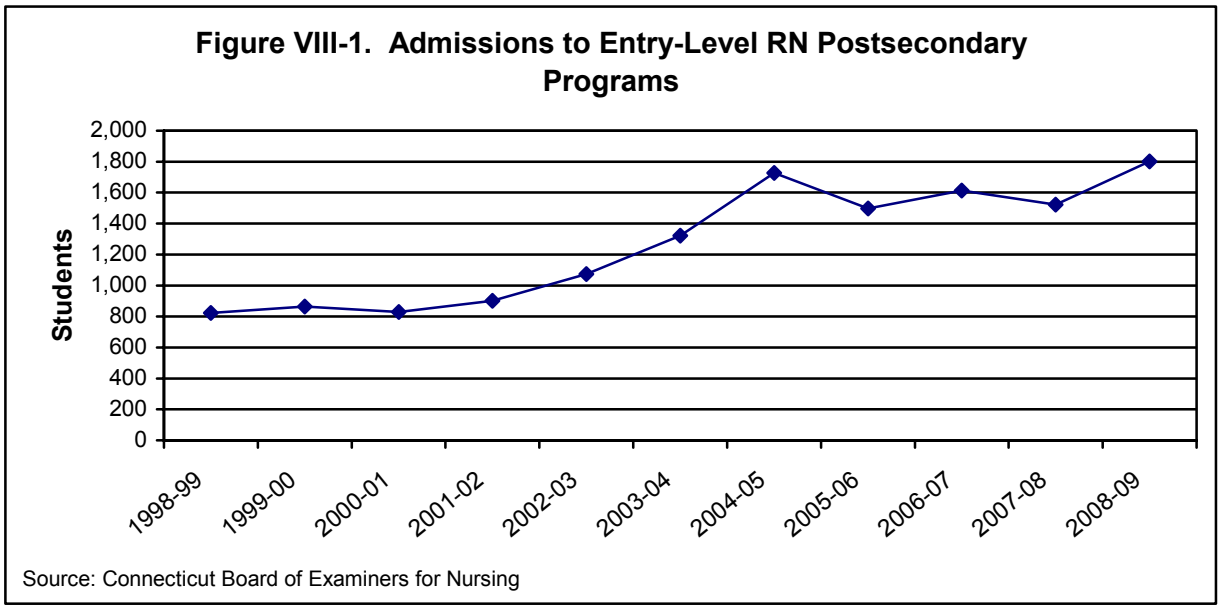
[1] Charter Oak State College offers an online LPN to RN Bridge course and an RN refresher course for RNs returning to the field, and an online perioperative nursing course to maintain a pool of qualified operating room nurses.
Source: Office of Legislative Research Report 2008-R-044 (updated by PRI staff)

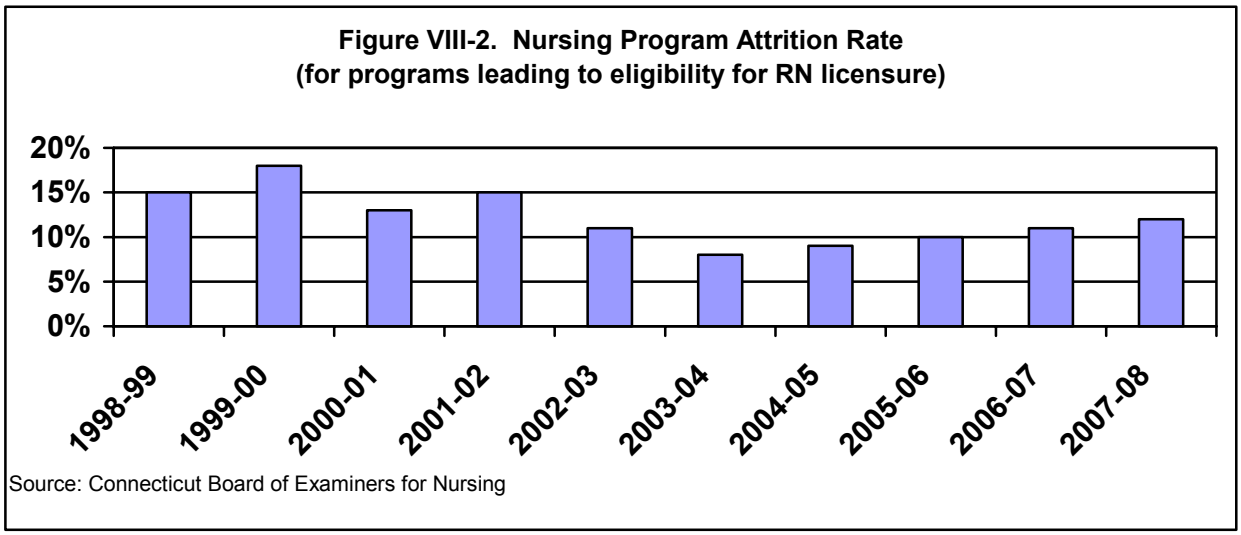
What are the Trends in Nursing Programs?

The program review committee reviewed a variety of trends related to postsecondary nursing programs in Connecticut to examine how the supply of students enrolled in entry-level RN nursing programs has changed since the shortage was first identified.

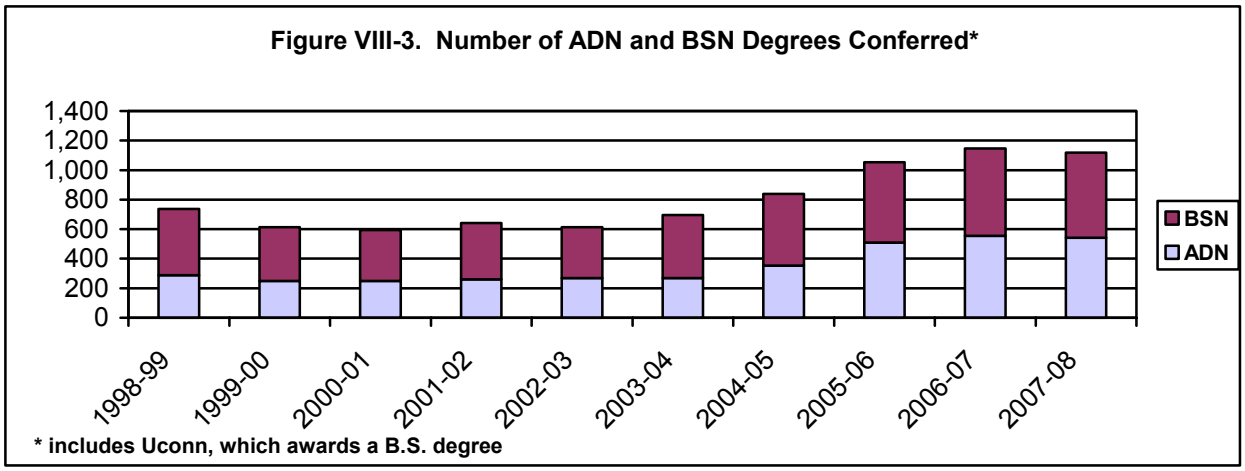
Trends in admission to nursing programs. Colleges and universities in the state have begun new or expanded their nursing programs to be able to enroll more students, although in interviews with PRI staff, many nursing program representatives indicated that many qualified students are still being denied admission because of limited program capacity. Based on the most recent data from the Connecticut Board of Nursing Examiners, 90 more students could have been accepted to entry-level RN nursing programs if additional capacity existed. Figure VIII-1 shows the number of admissions to nursing programs leading to RN licensure since the 1998-99 academic year. Admissions for 2008-09 had the greatest number of students over the 10 years examined, with 1,801 students admitted.

Attrition trends. The retention of students in nursing programs has important implications for the future supply of nurses. Figure VIII-2 shows program attrition rates for nursing programs that lead to RN licensure. The highest attrition rates were from 1998-99 to 2001-02. For the most recent academic year available, 2007-08, attrition was somewhat high at 11.6 percent. The school with the lowest attrition rate in 2007-08 was the University of Connecticut (.965 percent) and the highest was Capital Community College (28.1 percent). Despite increasing the number of students admitted to nursing programs, the attrition rate overall has remained below 15 percent, although it has increased since the 2003-2004 academic year.



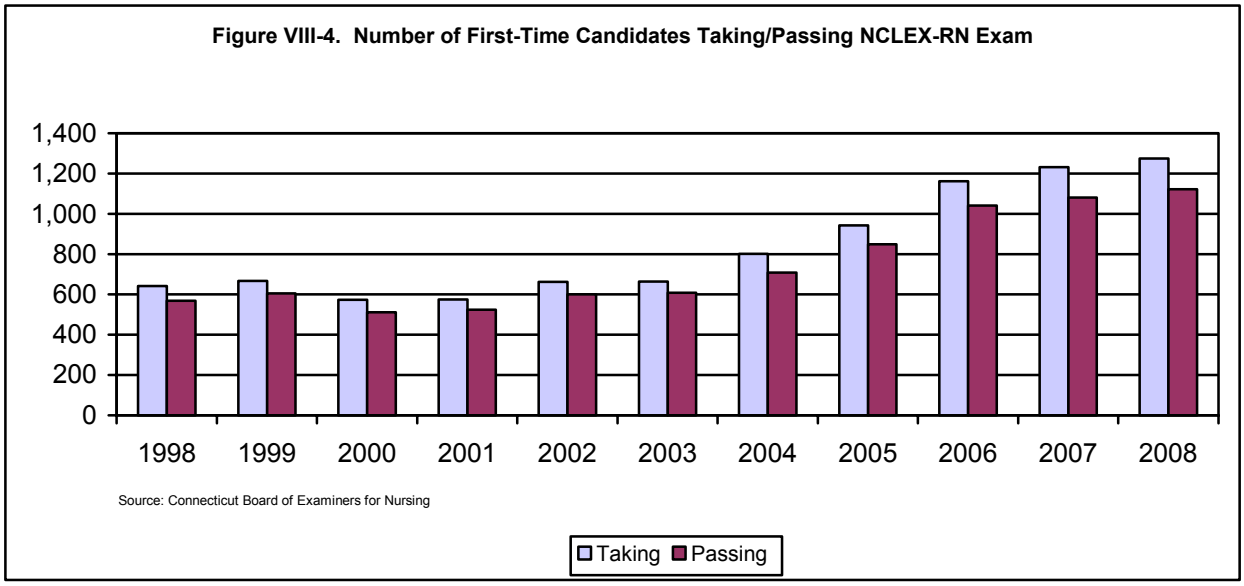


Trends in degree completion. Figure VIII-3 shows the number of nursing program graduates beginning in the 1998-1999 academic year. As the figure shows, the number of graduates decreased from 737 graduates in 1998-99 to 594 in 2000-01, but then increased substantially since 2003-04. The number of bachelor's of science nursing degrees outpaced the number of associate of science nursing degrees conferred in each year shown, even though the greatest increase is from students earning an associate's degree in nursing (88 percent) versus graduates of bachelor's of science nursing programs (29 percent). Overall, there were 524 more degrees conferred in 2007-08 than in 2000-01, the low point over the ten years examined. The greater number of degrees completed is a result of the increasing number of students admitted to nursing programs outpacing the rise in the attrition rate.



Passage of NCLEX-RN exam. Each state requires a candidate for RN and LPN licensure to pass an examination that measures the competencies needed to perform safely and effectively as a newly licensed, entry-level nurse. The National Council of State Boards of Nursing (NCSBN) developed two licensure examinations, the National Council Licensure Examination for Registered Nurses (NCLEX-RN), and the National Council Licensure Examination for Practical Nurses (NCLEX-PN) for those seeking to be licensed as LPNs. Both exams are used by states' boards of nursing to assist in making licensure decisions.

Committee staff examined the number of individuals that sat for the NCLEX-RN exam and the pass rate. Figure VIII-4 shows that 642 candidates took the exam for the first time in 1998 and 1,274 in 2008, an increase of 98.4 percent. The pass rate has been fairly consistent over the time period examined, of about eighty-eight percent for first-time candidates. In 2000, only 512 individuals passed the exam and by 2008, 1,122 individuals passed it, an increase of 119 percent.



Career ladders for RNs. Building the talent pipeline involves establishing career ladders that provide for a progression from entry level positions to higher levels that will provide increased pay, skills, or responsibilities. One ladder, provided by six colleges and universities in the state, offers RNs who hold either a diploma from a hospital-based program or an associate's degree in nursing, the opportunity to receive their bachelor's of science in nursing, partially through providing credit for work already undertaken at a lower level through articulation and other transfer agreements. A second ladder offered by a few schools, offers accelerated entry programs that allow individuals who hold a bachelor's degree in a non-nursing field to complete a bachelor's or master's nursing degree at an accelerated pace. Data from the Connecticut Board of Examiners show that 76 students who already were licensed as RNs enrolled in nursing baccalaureate programs in the 2008-09 academic year.

Masters and doctorate nursing program enrollment. Ten colleges and universities offer nursing-related degrees at the master or doctorate level. One of the concerns regarding the shortage of nurses is that there is a low number of candidates seeking master and doctorate degrees, because faculty need to have a master's degree to teach undergraduate students and a doctoral degree to teach graduate students in specialty nursing programs.

A study that was completed for the Allied Health Workforce Policy Board in January 2007 noted that the number of full-time nursing faculty across all schools and programs was about 184 in 2005; 18 percent of these faculty indicated that they planned on retiring by 2008. The report recommended a program be adopted to proactively produce replacement faculty. In addition, the report recommended that instead of greatly expanding Connecticut nursing programs, efforts should focus on increasing student retention rates. The report noted that lowering attrition rates would allow for existing resources to be used more efficiently by increasing graduates, rather than adding additional capacity but yet still resulting in the same number of graduates because of poor attrition. In interviews with officials from public higher education nursing programs, PRI staff were told that public institutions have lost additional nursing faculty under the state's recent early retirement program.

Number of master's and doctorate degrees. Figure VIII-5 shows trends in the number of degrees conferred for master or doctorate degrees. There has been a 26 percent increase in the number of students obtaining graduate degrees over the ten-year period examined. However, many graduates completing advanced degrees will enter advanced practice specialties and do not plan on teaching. Furthermore, according to interviews conducted by PRI staff, faculty salaries contribute to the lack of individuals being attracted to teaching. Wage statistics maintained by the Connecticut Department of Labor indicate the average salary of a RN in 2008 with an associate's degree is $71,699 while postsecondary nursing instructors and teachers average salary is $76,856.

Licensed Practical Nurse Programs

To apply for licensure in Connecticut as an LPN, an individual must complete a nursing program that is at least 12 months long with a minimum of 1,500 hours (50 percent of which must encompass clinical or observational care experiences), apply to the Department of Public Health, and pass a national exam. LPNs must work under the direction of a registered nurse or an

advanced practice registered nurse, or, for LPNs employed by home health agencies, under the direction of a physician licensed in Connecticut.

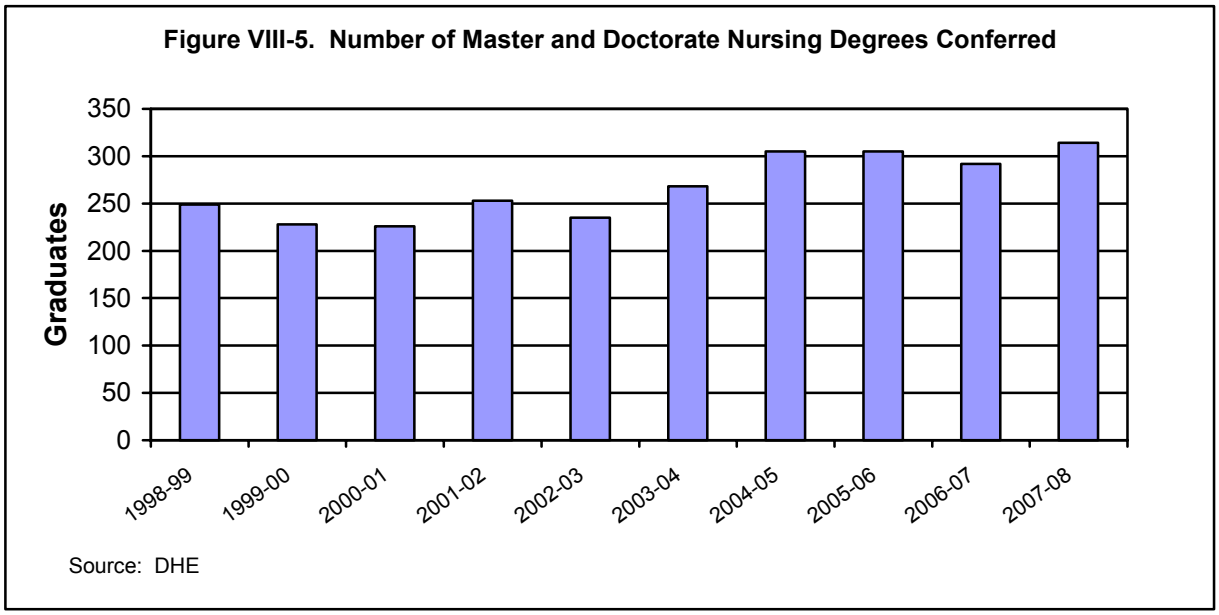


Table VIII-4 shows the ten Connecticut Technical High Schools (Adult Education Division) and three private occupational schools that offer licensed practical nurse programs.[71] To be eligible for admission, the individual must have either a high school degree or have passed the General Education Development exam (GED), as well as pass an entrance exam. The length of the programs differ. The technical schools offer full-time 16-month programs that can be completed in three semesters and part-time in two years, while programs offered by private occupational schools take anywhere from 15 months or longer to complete. Once the program is successfully completed, a graduate is eligible to sit for the national licensing examination (NCLEX-PN). According to wage statistics maintained by the Connecticut Department of Labor, the average salary of a LPN is $52,773.

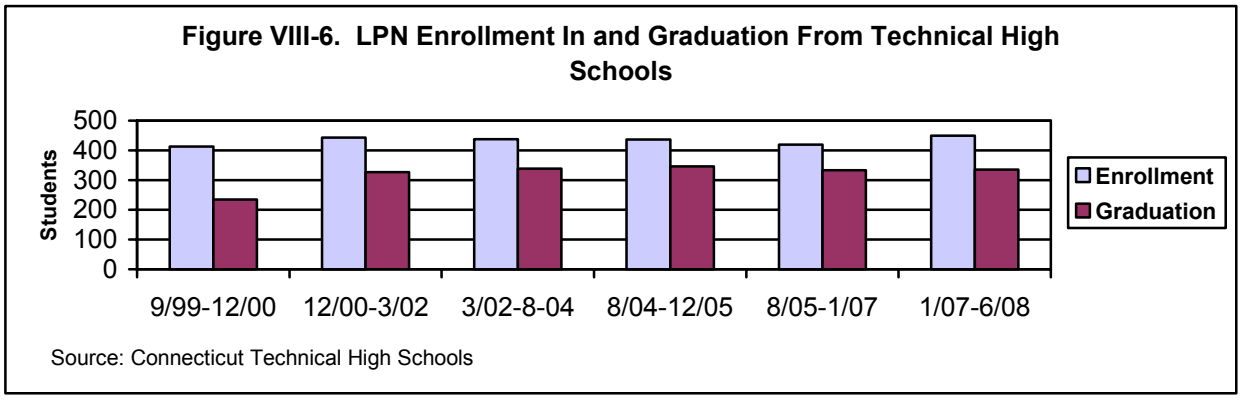
LPN enrollment and graduation trends. LPN program capacity at the technical high schools has not increased nearly as much as the RN programs (the increase has come from the growth in programs offered by proprietary schools). The number of students enrolling in and graduating from LPN programs offered by the technical high schools is shown in Figure VIII-6. The number of students enrolled in a technical school LPN program grew from 413 students admitted into the September 1999 class to 449 students admitted into the August 2008 class, an increase of only 9 percent. In comparison, the number of students enrolling in entry-level RN programs increased by 936 students over the same time period.

[71] On December 1, 2009, in a deficit mitigation plan, Governor Jodi Rell proposed suspending the adult education program for licensed practical nurses offered at the technical high schools to achieve savings of $1.7 million. The governor has the authority to make the cut and does not need legislative approval. Students currently enrolled in these programs will be allowed to finish (students in all but two of the programs are scheduled to graduate in December 2009.

Attrition rates in public LPN programs. Attrition rates in the technical high school LPN programs have been very high despite significant improvement over the years (Figure VIII-7). In the 1999 entering class, the attrition rate was 51 percent. The 2008 entering class was the

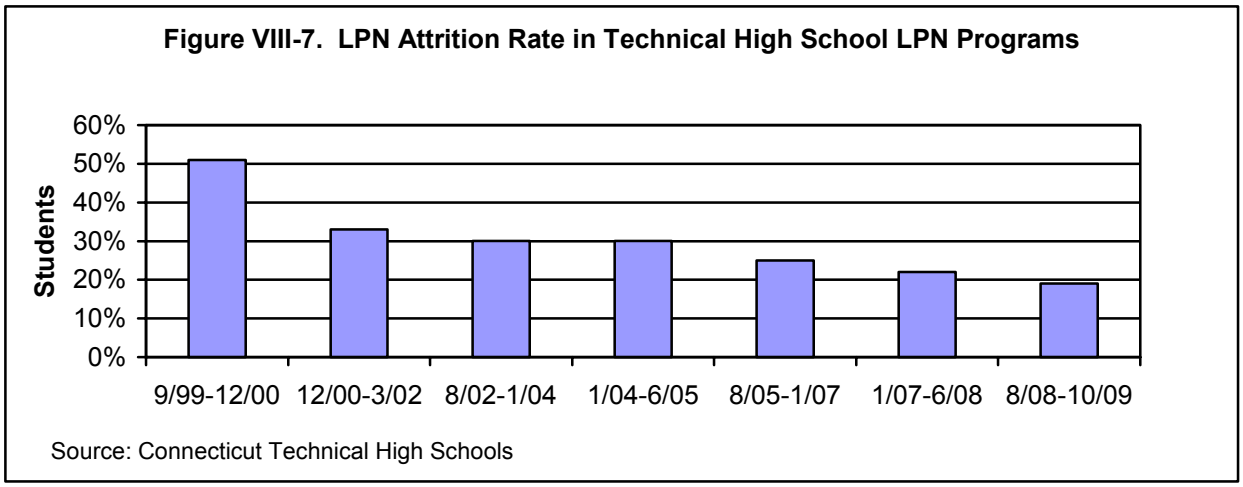
Table VIII-4. Licensed Practical Nurse Programs		
Technical High Schools	**Location**	**8/2008 – 10/2009 Enrollment**
Public		
A.I. Prince	Hartford	40
Bullard- Havens	Bridgeport	31
E.C. Goodwin	New Britain	40
Eli Whitney	Hamden	40
Henry Abbot[1]	Danbury	30 (FT) 15 (PT)
W.F. Kaynor	Waterbury	40
Norwich	Norwich	40
Vinal[1]	Middletown	30 (FT) 27 (PT)
Windham	Willimantic	30
Private (Occupational Schools)		
Lincoln Technical Institute	Hamden New Britain Shelton	n/a
Porter and Chester Institute	Enfield Rocky Hill Watertown	n/a
Stone Academy	East Hartford Hamden	n/a

[1] Evening program available
n/a: Enrollment information was not available, but the number of candidates sitting for the national exam is shown by public versus private schools in Figure II-2.
Charter Oak State College also offers an online LPN refresher course.
Source: SDE/Technical High Schools Website



first that had an attrition rate below 20 percent in all of the years examined. Data provided by the technical high schools shows that of the 79 students leaving the program in the 2008 class, 63

left for personal reasons, 12 because they failed theory coursework, 2 for clinical failure, and 5 because of high absenteeism. In the 1999 entering class, of the 210 students that left the programs, 123 left for person reasons, 49 because they failed theory coursework, 23 for clinical failure, and 15 because of absenteeism.



Passage of NCLEX-PN exam. In addition to the LPN program offered by the technical high school system, three proprietary schools also have programs. They are:

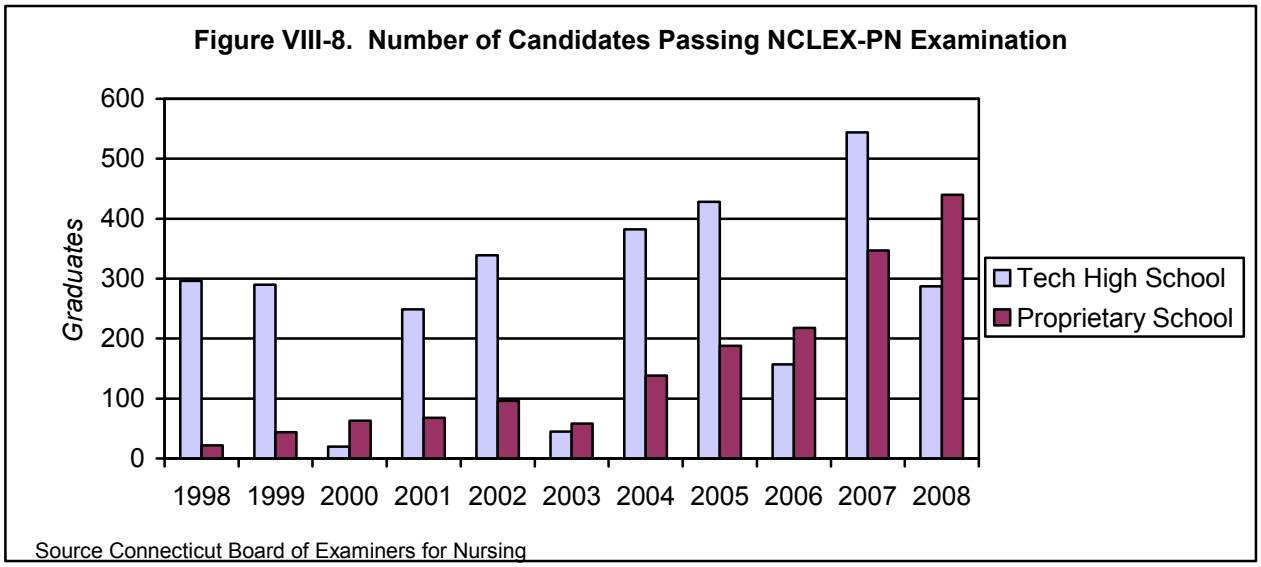
- Lincoln Technical Institute in New Britain, Hamden, and Shelton;
- Stone Academy in East Hartford and Hamden; and
- Porter & Chester Institute in Watertown.

Committee staff examined the number of individuals passing the NCLEX-PN, shown in Figure VIII-8 for both technical high school and proprietary school graduates. In 1998, there were 318 individuals who passed the exam, all but two of them having graduated from the technical high school. By 2008, a total of 727 graduates passed the exam, 61 percent of whom had graduated from a proprietary school. The number of graduates from proprietary school programs exceeded those from the technical school programs in 2006 and 2008. Some years (2000, 2003, 2006, and 2008) show a lesser number of individuals passing the exam from the technical schools because of the 16-month cycle for their full-time programs, which means that there are not program graduates each year from the technical high school programs.

Career ladders for LPNs. One way to build the talent pipeline is to encourage individuals to progress from one career level to the next. Charter Oak State College received a grant in 2007 to study the LPN programs offered by Connecticut's technical high schools. It recommended a number of changes be made including ways to create career ladders for individuals licensed as LPNs who want to become RNs.

As a result of the study, the technical school system aligned its LPN curriculum to meet the prerequisite requirements of the registered nurse programs offered at the state's community colleges beginning with the fall 2008 class. In order to receive college credit and be accepted

into a community college nursing program, technical school graduates must apply to Charter Oak State College and complete an online LPN-RN bridge class.



Data shows that 34 individuals who already are licensed as LPNs were admitted to postsecondary registered nurse programs for the 2008-2009 academic year, slightly less than 2 percent of the 1,801 total students admitted.

State Strategies to Address the Nursing Shortage

Several strategies were adopted in Connecticut in reaction to the impending nursing shortage predicted in the 1990s, and the response involved both public and private entities. Active participants in developing solutions to the potential public health crisis included the executive and legislative branches of government, the education and higher education departments, the four higher education constituent units (acting in concert or independently), independent colleges and universities, and the state's hospitals and other health care institutions.

Key factors contributing to the success of attracting more students to enroll in and graduate from the state's nursing programs, as shown in the trend data above, were: the creation of the Allied Health Workforce Policy Board (discussed below); the aggressive pursuit of federal, state, and private funding by colleges and universities, both collectively and individually, to provide tuition assistance; student advising; targeted student tutoring; the initiation of new and expanded nursing programs; and the collaborative partnerships developed between the nursing programs, hospitals, and other health care institutions/associations in the state.

Below are examples of some of the strategies that were implemented. The examples are grouped by ways in which certain strategies have been adopted and implemented in order to overcome the five barriers identified in Chapter VI of this report.

Barrier 1: Related to Elementary and Secondary School Students. It has been well documented that students entering higher education are often unprepared and lack the reading and math skills necessary for successful completion of college coursework. This is particularly true for students who want to enter nursing programs, where admission is very competitive and

there are numerous math and science prerequisites. Many of the initiatives that were undertaken to attract students to nursing (and other allied health) careers and prepare for entrance into college programs addressed the elementary and middle school levels.

Examples of some of the strategies used are intended to increase awareness, better prepare, or create career paths from high school to careers in nursing (and other allied health fields) at the high school level include:

- UConn Health Center and its four Area Health Education Centers conduct career days and other career programs at the high school level to introduce students to the types of health care careers available.

- Health Careers Pathways Certificate program (discussed below), offered by the community college system, is integrated into high school counseling so that students are aware of the program and the opportunities available in the nursing and allied health care field.

- Dual Enrollment Initiative, led by the community college system, allows high school students to take credit courses in math, science and technology in their junior and senior years of high school at the community colleges and receive college credit.

- UConn School of Nursing has partnered with Harford Public High School Nursing Academy to increase interest in the nursing field and attract minority students.

- The Office of Workforce Competitiveness, the technical high school system, and the community college system provide high school students with planned coursework, which allows articulation into the community college system for a certificate or associate degree in an allied health discipline.

- Connecticut Career Choices Program, facilitated by OWC, promotes a curriculum to provide the math and science skills necessary for students interested in technology and nursing careers. Efforts were being made to align this curriculum with the Health Career Pathways Certificate program at the community college system, but funding was eliminated in the 2009 – 2011 biennium budget.

Barrier 2: Related to Postsecondary Education Institutions. Some of the barriers to alignment include the multiple goals of colleges and their conflicting viewpoints on whether they are preparing generalists or specialists. Further, community college graduation rates continue to remain lower than expected, based on a sizable percent of students hoping to attain their associate degree.

Attrition rates. One reason that attrition rates in community college nursing programs are lower than those for the colleges' general education programs is because the nursing programs have selective, competitive admission policies (i.e., not all who apply are admitted). In addition, several prerequisites must be completed before a student can even be considered for admission to the program. Thus, students may be better prepared than those in general education

programs, as evidenced by the higher retention rates among community college students enrolled in nursing programs.

However, compared to other nursing programs in the state, four of the five community college programs had the highest attrition rates, with Capital Community College at 28 percent for the 2007 academic year, followed by Gateway (17.6 percent), Norwalk (16.1 percent), and Naugatuck Valley (11.4 percent). The Bridgeport Hospital's RN diploma program and Three Rivers Community College tied, with an attrition rate of 10.4 percent.

Efforts to improve attrition rates. In 2005, the Connecticut Community College System received two U.S. Department of Labor grants that focused on attracting and supporting careers in allied health fields. The grants provided for a number of strategies designed to attract more individuals to nursing and other allied health careers and additional supports to students enrolled in these types of programs. Both grants include a joint initiative with the Workforce Investment Boards that have staff who have been trained as Health Care Advisors to assist in counseling individuals about the allied health career opportunities offered through the community college system.

The first grant, funded November 2005 to October 2008, was $2.1 million. The purpose of "The Career Pathways Initiative in Nursing and Allied Health" was to produce a higher rate and number of graduates in nursing and allied health by increasing instructional supports, enhancing curriculum targeting, and providing academic and career counseling. This grant received a no-cost extension and runs until December 31, 2009.

The second grant is funded from January 2007 to December 2009, and also is for $2.1 million. Called "The Bridges to Health Career Initiatives," it was focused on students who were receiving developmental education or enrolled in noncredit programs. Grant funds allow for targeted advising so that students could successfully transition into credit certificate programs or associate degrees.

The Health Career Pathways Certificate program, referenced above, was developed under the Bridges to Health Career Initiatives grant and is designed to assist with the coursework necessary to apply to other health care programs, such as nursing. Credits from this program may be applied toward health care programs requirements within the community college system.

Connecticut Workforce Investment Strategies for Healthcare (WISH application). Since the two grants discussed above end in December 2009, the Office of Workforce Competitiveness submitted a new grant application in October 2009 for $5 million in federal stimulus funding to expand the state's health care workforce. Called Connecticut Workforce Investment Strategies in Healthcare (WISH), the state would use the funding to provide scholarships and affordable education and to support reeducation for unemployed individuals or those in low-income jobs who are interested in pursuing nursing or other health-related careers. Specifically, $900,000 of the grant would be expected to go toward the provision of scholarships and financial support for students pursuing health care careers. The intent of applying for the grant is to build on the successful collaboration that has been established under the two previous grants received by the community college systems and maintain Health Career Advisors in each of the five WIBs.

Other initiatives to grow the nursing pipeline. Public and private postsecondary institutions with nursing programs undertook many initiatives designed to provide student supports, expand programs, and partner with hospitals, the major employers concerned with ensuring the pipeline of nurses continued to expand. Examples of some of the strategies adopted include:

- increasing opportunities for career mobility through the use of articulation agreements for all levels of nursing (LPN to RN, RN to BSN, RN to MSN);
- establishing and expanding accelerated BSN or MbEIN programs for individuals with a bachelor's degree in a non-nursing field seeking a nursing degree;
- expanding program enrollment, particularly at the community college and associate degree level;
- initiating the Connecticut Community College Nursing Program (CT-CCNP), which is a system-wide approach to nursing admissions, curriculum, and testing. It allows students to complete a standard nursing admissions process for any one of the five colleges and seamlessly transfer among the colleges;
- establishing new degree programs at the aster's and doctorate levels;
- forging partnerships with area hospitals to increase clinical placements, offer students hospital-funded scholarships, and/or develop visiting-faculty arrangements with master's-prepared hospital-based nursing; and
- pursuing funds to make scholarships available to all nursing students from RN through doctorate programs.

Noted above is just a sampling of some of the activities that have occurred to grow the nursing pipeline in the state. In addition to formal system-wide programs, individual colleges and universities that operate nursing programs also have their own initiatives and policies aimed at recruitment and retention.

Barrier 3: Difficulty in Making Accurate Demand Projections. Limited information is available on the accuracy of the DOL job demand projections. DOL staff do not look back to determine whether previous projections made for future years were accurate in terms of the number of job openings that were available when that year arrived. As noted in the Chapter VI, that there may be a lack of awareness of the DOL projections and questioned whether the projections were actually being used by college administrators, faculty and students.

The program review committee assessed the accuracy of projections made in 1998 for the year 2008 (projections are made for 10 years out) in Chapter III and found the number of openings for registered nurse projected and actually employed was very accurate. Only two percent more RNs were employed than had been projected as being needed. Similar projections by DOL for LPNs, however were fairly inaccurate: DOL projected 17 percent more openings for LPNs than were actually employed.

The program review committee found that, contrary to higher education institutions and other organizations, the Allied Health Workforce Policy Board relied on projections made by DOL, along with other data such as the nurse vacancy surveys done annually by the Connecticut Hospital Association, to support its own recommendations from year to year.

Furthermore, concerned about the lack of data available quantifying the number of nursing and other allied health faculty available to educate students seeking admission to such programs, the AHWPB recommended two studies be undertaken. The Office of Workforce Competitiveness commissioned a Nursing and Allied Health Faculty Staffing Plan, which was completed in January 2007. The study examined the faculty necessary to meet current and projected labor market training needs in all allied health areas for both public and private higher education institutions and outlined the current and projected resources for allied health programs to meet workforce shortages. It contained several recommendations that have been incorporated into proposals put forth by the AHWPB.

The other AHWPB study concerned clinical placement capacity and was completed by the CHA in July 2007. The report, "Clinical Placement Capacity Assessment Project Report" determined the current status of Connecticut's clinical placement capacity for nursing and certain allied health students to complete the required clinical components of their programs.

As noted above, there is no demographic data available on Connecticut's licensed nurses. Some of these concerns may be alleviated when DPH rolls out its online license renewal system for nurses, which is anticipated by the end of this year. However, as noted above, mail-in renewal is still possible and demographic information for nurses who choose this method will not be electronically captured or compiled. Given that there is a greater than 20,000 nurse discrepancy that exists between the number of licensed nurses in the state (captured by DPH) and the number that are employed (captured by DOL), it is clear better data will still need to be developed in order to determine the adequacy of supply.

Authors of a recent article in *Health Affairs, The Policy Journal of the Health Sphere*, noted the recent increase in employment and the increase in the number of students entering and graduating from nursing programs has improved projections of the future supply of RNs, but still projected a shortage in the future because of the rapidly aging workforce.[72]

The 2009 AHWPB report notes that the state appears to be producing an adequate supply of LPNs. Comparing Connecticut DOL projections on the number of annual openings for nurses for the 2006 to 2016 years to the number of individuals taking the NCLEX-RN appears that supply and demand are equal and that there is an oversupply of LPNs. However, there are many unknowns in the future, especially regarding the expansion of health care. In addition, a recent study found baby boomers are facing higher disability rates as they age than the previous generation, which will increase demand for nurses.[73]

[72] Dr. Peter Buerhaus, Health Affairs, The Policy Journal of the Health Sphere, Surge in Nurse Employment: Causes and Implications, Julu/August 2009.
[73] Teresa E. Seeman, Sharon S. Merkin, Eileen M. Crimmins, and Arun S. Karlamangla. Disability Trends Among Older Americans: National Health and Nutrition Examination Surveys, 1988–1994 and 1999–2004 ,American Journal of Public Health, November 12, 2009.

To further call into question whether or not the demand for nurses has reached a saturation point, results of a recent survey by the Connecticut Conference of Independent Colleges found anywhere from 65 percent to 100 percent of graduates of RN nursing programs were employed within six months of graduation.

Barrier 4: Current Economic Challenges. A significant factor impacting the job projections both at the state and national level are current economic conditions, such as the recent recession. The literature reviewed indicates that nursing shortages are cyclical and during times of high unemployment, nurse supply is not as low as in better economic times. These studies have shown that more nurses work in direct care, full-time, and re-enter the workforce during economic lows. In addition, nurse demand may be lower during economic downturns because individuals who become unemployed often lose their health care and may put off elective surgery.

Barrier 5: Related to State Agency Organization, Programs, and Policies. As noted previously, Connecticut's decentralized system of public higher education often results in decisions being made from the bottom up – at the individual college or constituent level, rather than in a centralized manner that makes strategies uniform across all colleges.

Recognizing the need to bring together a working group of individuals focused on increasing the number of nurses, the legislature created the Allied Health Workforce Policy Board under P.A. 04-220 (codified as C.G.S. Sec. 4-124dd). The board is charged with conducting research and planning activities related to the allied health workforce.[74] Its eight statutory responsibilities are:

- Monitoring data and trends in allied health workforce including current and future:
    - supply and demand for allied health professions;
    - capacity of the state system of higher education to educate and train students pursing allied health professions;
- Develop recommendations for the formation and promotion of an economic cluster for allied health professions;
- Identify recruitment and retention strategies for public and independent institutions of higher education with allied health programs;
- Develop recommendations for promoting diversity in the allied health workforce;

[74]Defined as professionals or paraprofessionals who are qualified by special training, education, skills and experience in providing health care, treatment and diagnostic services, under the supervision of or in collaboration with a licensed practitioner, and includes but is not limited to, physician assistants, registered nurses, licensed practical nurses, certified nurse assistants, home health aides, radiological technologists and technicians, medical therapists and other qualified technologists and technicians.

- Develop recommendations regarding financial and other assistance to students enrolled in or considering enrolling in allied health programs offered at public or independent institutions of higher education;

- Identify recruitment and retention strategies for allied health employers;

- Develop recommendations about recruiting and utilizing retired nursing faculty members to teach or train students to become licensed practical nurses or registered nurses; and

- Examine nursing programs at public and independent institutions of higher education and develop recommendations about the possibility of streamlining the curricula offered in such programs to facilitate timely program completion.

The board held its first meeting in March 2005 and submitted its first annual report to the legislature in February 2006. The board meets regularly to discuss current state initiatives in allied health, and comprises a variety of stakeholders: state legislators, state agencies, higher education institutions, Workforce Investment Boards, high schools, professional associations and state agencies. It is a central repository for information about the multitude of efforts taking place by the various parties to address the nursing shortage. The executive director of the Connecticut Women's Education and Legal Fund is under contract to provide staff services to the board.

Although the board has no formal authority beyond what is outlined in statute, it has been very successful in fostering collaboration among the various partners and the institutions that they represent. It provides a formal mechanism for information to be exchanged and shared among parties working toward the common goal of addressing allied health workforce shortages.

Annual reports. The Allied Health Policy Board has submitted four annual reports to the legislature. The reports examine Connecticut Department of Labor data, vacancy survey data completed periodically by DOL and annually by the Connecticut Hospital Association, and other targeted data to determine demand for allied health workers. The reports also contain descriptions and documentation on the status of various initiatives proposed the prior year, identify any outcomes that have resulted from previous initiatives, and propose recommendations for the following year. Finally, the report provides snapshots of separate efforts occurring outside the board, but aimed at producing a future supply of allied health graduates. The board's last annual report (February 2009) shifts much of the focus for the first time to other allied health professions – beyond nursing – in which worker shortages are anticipated.

Accomplishments. As noted above, sometimes the board acts as the lead for a particular strategy or initiative. At other times, it is involved in the decision-making process but another agency or entity serves as lead. Still other times, the board serves as a forum for initiatives undertaken, to share ideas about all of the collective and individual efforts by higher education intuitions to increase the number of nursing program graduates.

In the five years that the board has been in existence, multiple strategies have been successfully used to increase the number of RN nursing graduates, from associate degrees through doctorates. The program review committee found the Allied Health Workforce Policy Board has been a successful vehicle to bring together stakeholders and could be used as a model

to address other specific workforce shortage areas. There were also countless examples of hospitals and other healthcare agencies partnering with public and private postsecondary institutions that allow for hospital nursing staff with master's degrees to act as preceptors (experienced nurses who facilitate student learning in a clinical setting), sponsoring scholarships for nursing students at every degree level, and sustaining an online program begun by Charter Oak State College to develop skills needed in hospital operating rooms.

There also are many initiatives between independent colleges and community colleges as feeder schools. Several articulation agreements with area colleges were developed for RNs with an associate degree to apply the credits earned toward a bachelor's degree in nursing. According to interviews conducted by committee staff, one reason for the generally high level of student success in nursing programs is that there is an emphasis on retention, not just recruitment. Efforts incorporated a range of institutions and ideas, including accelerated second degree programs, promoting nursing even to middle school students, academic supports to reduce attrition of enrolled students, tuition subsidies, private and public grants, scholarships, outreach to high school students, and creation of career ladders through promotion and incentives.

In 1998, 318 LPN graduates passed the national exam that is required for licensure and by 2008, 727 individuals passed it, an increase of 129 percent. Similarly, in 1998, 569 individuals passed the national exam required for RN licensure and by 2008, 1,122 individuals passed it, a 97 percent increase. Thus, the implementation of a multitude of strategies has led to the successful increase in the number of LPNs and RNs and could be applied to address other workforce shortage areas. These strategies are:

- public advertising campaigns by colleges and universities to increase awareness of certain occupations as a career;
- initiatives at the high school level to interest students in certain careers;
- funding for schools to initiate new or expand existing programs;
- the aggressive pursuit of federal, state, and private funding by colleges and universities, both collectively and individually, to provide tuition assistance, student advising, and targeted tutoring aimed at increasing retention;
- scholarships and loan forgiveness programs;
- collaborative partnerships between colleges and universities with business and industry to provide faculty, scholarship funding, and internship opportunities for students; and
- a formal mechanism, such as a workforce policy board, for members to communicate and share strategies implemented by one college or university so that similar solutions could be applied by other postsecondary institutions, and to propose solutions as a unified body.

APPENDICES

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APPENDIX A

CT DOL OCCUPATIONAL EMPLOYMENT AND WAGES

METHODOLOGY

SCOPE

The Occupational Employment Statistics (OES) survey is a semiannual mail survey measuring occupational employment and wage rates for wage and salary workers in nonfarm establishments. In November 2002, the OES survey changed from an annual survey of 7,000 establishments to a semiannual survey of 3,500 establishments. The OES survey samples and contacts establishments in May and November of each year and, over 3 years, contacts approximately 21,000 establishments. The full three-year sample allows the production of estimates at fine levels of geographic, industrial, and occupational detail.

The OES survey covers all full-time and part-time wage and salary workers in nonfarm industries. The survey does not include the self-employed, owners and partners in unincorporated firms, household workers, or unpaid family workers.

In 1999, the OES survey began using the Office of Management and Budget's occupational classification system, the Standard Occupational Classification system (SOC). The OES survey categorizes workers in one of about 800 detailed occupations. Together, these detailed occupations comprise 22 major occupational groups. The major groups of the SOC system are as follows:

- Management occupations
- Business and financial operations occupations
- Computer and mathematical occupations
- Architecture and engineering occupations
- Life, physical, and social science occupations
- Community and social services occupations
- Legal occupations
- Education, training, and library occupations
- Arts, design, entertainment, sports, and media occupations
- Healthcare practitioners and technical occupations
- Healthcare support occupations
- Protective service occupations
- Food preparation and serving related occupations
- Building and grounds cleaning and maintenance occupations
- Personal care and service occupations
- Sales and related occupations
- Office and administrative support occupations
- Farming, fishing, and forestry occupations
- Construction, and extraction occupations

- Installation, maintenance, and repair occupations
- Production occupations
- Transportation and material moving occupations
- Military specific occupations (not surveyed in OES)

RESPONSE

The statewide response rate for the May 2007 survey was 77 percent for establishments, covering 73 percent of weighted employment.

CONCEPTS

Data were collected primarily by mail. Survey schedules were initially mailed out to most of the sample establishments while personal visits were made to some of the larger companies. Two additional mailings were sent to nonrespondents at approximately three-week intervals. Telephone follow-ups and, in some cases, personal visit follow-ups were made for those nonrespondents considered critical to the survey due to their size.

Employment is the estimate of total wage and salary employment in an occupation across the industries in which it was reported. The OES survey form sent to an establishment contains between 50 and 225 SOC occupations selected on the basis of the industry classification and size class of the sampled establishments. Each survey form is structured to allow a respondent to provide information for each detailed occupation employed at the establishment; that is, unlisted occupations can be added to the survey form.

Wages for the OES survey are straight-time, gross pay, exclusive of premium pay. Base rate, cost-of-living allowances, guaranteed pay, hazardous-duty pay, incentive pay including commissions and production bonuses, tips, and on-call pay are included. Excluded are back pay, jury duty pay, overtime pay, severance pay, shift differentials, nonproduction bonuses, employer cost of supplementary benefits, and tuition reimbursements.

Each industry-specific questionnaire contained a grid of occupational titles, grouped by occupational division, with twelve wage ranges and a total column. Employers were asked to indicate the number of workers they employed in each wage range by occupation. Workers performing the functions of more than one occupation were to be classified in the occupation with the highest level of skill; or, if there was no measurable difference in skill requirements, workers were to be classified in the occupation in which they spent most of their time.

The wage intervals are defined both as hourly rates and the corresponding annual rates, where the annual rates are constructed by multiplying the hourly wage rate for the interval by the typical work year of 2,080 hours. In reporting, the respondent can reference either the hourly or the annual rate, but is instructed to report the hourly rate for part-time workers. Wage interval endpoints are determined by using the wage rate data

collected by the Bureau of Labor Statistics' National Compensation Survey (NCS). In the case of the open-ended lower interval (Range A), Connecticut's 2007 minimum wage of $7.65 was used as the interval's starting point.

Range	Hourly	Annual
A	Under $7.50	Under $15,600
B	$7.50 - $9.49	$15,600 - $19,759
C	$9.50 - $11.99	$19,760 - $24,959
D	$12.00 - $15.24	$24,960 - $31,719
E	$15.25 - $19.24	$31,720 - $40,039
F	$19.25 - $24.49	$40,040 - $50,959
G	$24.50 - $30.99	$50,960 - $64,479
H	$31.00 - $39.24	$64,480 - $81,639
I	$39.25 - $49.74	$81,640 - $103,479
J	$49.75 - $63.24	$103,480 - $131,559
K	$63.25 - $79.99	$131,560 - $166,399
L	$80.00 and over	$166,400 and over

Because OES wage data are collected into 12 contiguous, nonoverlapping wage intervals, the individual wage rates of the workers are not captured. A mean wage value is calculated for each wage interval based on occupational wage data collected by the Office of Compensation and Working Conditions for the National Compensation Survey (NCS).

STATE DATA

Data are collected for the universe of state government agencies, rather than a sample of employment. State government operations are surveyed every year, with the data collected and processed with the rest of the survey responses.

ESTIMATION METHODOLOGY

Beginning with the fourth quarter of 2002, the OES survey samples approximately 3,500 establishments semiannually in two panels. One panel is sampled in the second quarter, the other in the fourth quarter. Approximately 21,000 establishments are sampled over a six-panel cycle. While estimates can be made from a single panel or a single year of data, the OES survey is designed to produce estimates at a desired level of precision using six panels. A six-panel sample allows the production of estimates at fine levels of geographical, industrial, and occupational detail. For the May 2007 OES survey, estimates are based on data collected from establishments in May 2007, November 2006, May 2006, November 2005, May 2005 and November 2004.

Combining multiple years of data has statistical advantages. Significant reductions in sampling error can be achieved by taking advantage of a full three years of data, which

covers over 70 percent of the employment in Connecticut. While there are significant advantages, the limitation associated with this estimation procedure is that it requires "wage-updating" for the earlier years of data. For "wage-updating" purposes, the OES program has been using the Bureau of Labor Statistic's Employment Cost Index (ECI) to update wage rate data from previous panels before combining them with the current panel. The wage updating process assumes that: (1) each occupation's wage rate, as measured in earlier panels, shifts across time at the same pace as the broader occupational division that encompasses it and (2) geography and industry are not major factors in the wage updating process. The Bureau has conducted research over the past several years on the accuracy of updating wage rates using the ECI. In this research, the ECI wage-updating approach was compared to alternative modeling approaches. Current research results support the continued use of ECI wage-updating.

In addition, a "nearest neighbor" hot deck imputation procedure was used to impute occupational employment totals for establishments that reported no employment data. For establishments that reported or imputed occupational employment totals but did not report an employment distribution across the wage intervals, a variation of mean imputation was used to impute the distribution. During estimates processing, OES employment estimates are benchmarked to the mean of employment totals extracted from the Bureau of Labor Statistic's November 2006 and May 2007 Quarterly Micro Files.

RELIABILITY OF ESTIMATES

Estimates calculated from a sample survey are subject to two types of error: sampling and nonsampling.

Sampling error occurs when estimates are calculated from a subset of the population (i.e., a sample) instead of the full population. When a subset of the population is sampled, it is very likely that the sample estimate of the characteristic of interest will differ from the population value of that characteristic. Differences between the sample estimate and the population value will vary depending on the sample selected. This variability can be estimated by calculating the standard error (SE) of the sample estimate. The OES survey uses the relative standard error (RSE) of a sample estimate to measure sampling error. RSE is defined as the sample error of a sample estimate divided by the sample estimate itself. This statistic provides the user with a measure of the relative precision of the sample estimate. Relative standard errors (RSEs) are calculated for both occupational employment and mean wage rate estimates. In general, estimates based on many establishments have lower RSEs than estimates based on few establishments.

Nonsampling error occurs for a variety of reasons, none of which are directly connected to sampling like sampling error. Examples of nonsampling error include: nonresponse, data incorrectly reported by the respondent, mistakes made in entering collected data into the database, mistakes made in editing and processing the collected data.

Source: http://www.ctdol.state.ct.us/lmi/internet/methodology.htm

Appendix B

Occupations and CT Postsecondary Education Institution Completion Figures for 2008 Certificates or Degrees Earned	
Occupation	**CT postsecondary institutions offering certificates or degrees in the Occupation**
Healthcare Practitioners and Technical Occupations	
Emergency Medical Technicians and Paramedics	29 (Goodwin: 5; NorwalkCC: 2; CCC: 22)
Registered Nurses	1,109 (GCC: 60; CCC: 89; CCSU: 9; Fairfield: 84; Goodwin: 113; HCC: 14; Naugatuck CC: 79; Norwalk CC: 55; Quinnipiac: 105; Sacred Heart: 38; St Joseph: 49; SCSU: 73; St. Vincent's: 57; Three Rivers CC: 74; UConn: 142; UHart: 27; WCSU: 41)
Licensed Practical and Licensed Vocational Nurses	324 (No detailed info)
Surgical Technologists	12 (MCC: 12)
Radiation Therapists	120 (CCC=17; GCC=5; MiddlesexCC=17; NaugCC=17; Quinnipiac=33; St. Vincent's College=15; UHart=16)
Occupational Therapy	47 (Quinnipiac: 36; Sacred Heart: 11)
Occupational Therapy Assistant	32 (Briarwood: 8; Housatonic CC: 9; MCC: 15)
Physical Therapy	47 (UConn: 28; UHart: 19)
Physical Therapy Assistant	17 (CCC: 1; Housatonic CC: 2; MCC: 3; Naugatuck CC: 8; Northwestern CC: 2; Tunxis CC: 1)
Nutrition and Dietetics	37 (UConn: 18; UNH: 19)
Dental Hygienist	143 (Tunxis CC: 32; U of Bridgeport: 67; UNH: 44)
Social Worker	373 (CCSU: 11; ECSU: 22; Post: 8; Sacred Heart: 13; St. Jo: 17; SCSU: 100; WCSU: 33; UConn: 169)
Substance Abuse and Behavioral Disorder Counselors	61 (GCC: 38; MCC: 20; NaugCC: 1; TunxisCC: 2)
Pharmacists	103 (UConn: 103)
Pharmacy Technicians	0 (Trained OJT by chain drug stores)
Veterinarians	0
Veterinary Technologists and Technicians	11 (NWCC: 11)

Occupation/Certificate	CT postsecondary institutions offering certificates or degrees in the Occupation
Education, Training & Library Occupations	
Art Education	92 (CCSU: 34; SCSU: 56; UHart: 1; U of Bridgeport: 1)
Bilingual Education, PK-12	0
Comprehensive Special Education, 1-12	200 (CCSU: 12; Fairfield U: 14; St. Joseph: 32; SCSU: 92; UConn: 20; UHart: 25; CREC: 5)
Elementary School Teachers, Except Special Education	1,358 (CCSU: 164; ECSU: 68; Fairfield: 19; Quinnipiac: 54; SCSU: 168; U of Bridgeport: 253; UConn: 48; UHart: 23; WCSU: 88; Conn Coll: 14; Sacred Heart: 290; St. Jo: 63; UNH: 105; Yale: 1)
English, 7-12	218 (CCSU: 30; ECSU: 12; SCSU: 36; UConn: 23; WCSU: 5; Albertus Magnus: 2; Conn Coll: 6; Fairfield: 13; Quinnipiac: 8; Sacred Heart: 24; St. Jo: 10; U of Bridgeport: 22; UHart: 3; UNH: 21; Yale: 3)
Intermediate Administrator	554 (WCSU: 9; Fairfield U: 2; UHart: 10; SCSU: 147; Sacred Heart: 191; CCSU: 76; U of Bridgeport: 46; UConn: 73)
Mathematics, 7-12	123 (CCSU: 27; ECSU: 7; SCSU: 19; UConn: 14; WCSU: 4; Albertus Magnus: 4; Conn Coll: 1; Fairfield: 9; Quinnipiac: 4; Sacred Heart: 13; U of Bridgeport: 13; UNH: 3; St. Jo: 5)
Music, PK-12	88 (CCSU: 11; SCSU: 1; UConn: 13; ECSU: 1; UHart: 27; WCSU: 26; Conn Coll: 1; U of Bridgeport: 8)
Physical Education	117 (CCSU: 41; ECSU: 39; SCSU: 37)
Science, 7-12	121 (CCSU: 12; SCSU: 30; UConn: 15; WCSU: 2; ECSU: 2; Conn Coll: 3; Fairfield: 8; Quinnipiac: 2; Saint Jo: 2; Sacred Heart: 14; U of Bridgeport: 17; UNH: 13; Yale: 1)
Secondary School Teachers, Except Special and Voc. Ed.	742 (CCSU: 107; UConn: 76; SCSU: 128; WCSU: 29; ECSU: 36; Quinnipiac: 23; U of Bridgeport: 89; Conn Coll: 12; Fairfield: 48; UHart: 5; UNH: 68; Sacred Heart: 80; St. Jo: 24; Yale: 10; Albertus Magnus: 7)
Speech and Language Pathology	47 (SCSU: 38; UConn: 9)
Technology Education, PK-12	13 (CCSU: 13)
World Languages, 7-12	46 (SCSU: 14; WCSU: 6; CCSU: 7; UConn: 6; Fairfield: 5; Quinnipiac: 4; Sacred Heart: 3; Conn Coll: 1)
Business, 7-12	20 (CCSU: 2; UNH: 9; Sacred Heart: 4; U of Bridgeport: 5)
History & Social Studies, 7-12	260 (WCSU: 18; SCSU: 43; CCSU: 36; UConn: 24; ECSU: 15; Quinnipiac: 9; Conn Coll: 2; Fairfield: 18; UNH: 22; Sacred Heart: 25; U of Bridgeport: 32; St. Jo: 7; Yale: 6; Albertus Magnus: 1; UHart: 2)
School Counselor	125 (WCSU: 23; UConn: 11; SCSU: 17; CCSU: 25; Fairfield: 14; UHart: 14; St. Jo: 21)
Librarians	119 (SCSU: 119)
Library Media Specialist	13 (Fairfield: 2; SCSU: 11)

Architecture & Engineering	
Civil Engineers	81 (UConn: 56; UNH: 9; UHart: 16)
Industrial Engineers	36 (Fairfield: 16; UConn: 12; UNH: 8)
Mechanical Engineers	290 (Fairfield: 22; Rennselaer: 22; U of Bridgeport: 58; UConn: 109; UHart: 30; UNH: 19; Yale: 30)
Mechanical Engineering Technicians	44 (GCC: 2; Naugatuck CC: 1; Three Rivers CC: 3; CCSU: 25; UHart: 13)
Architect	102 (UHart: 6; Yale: 96)
Other Occupations	
Airline Pilots, Copilots, and Flight Engineers	0
Accountants and Auditors	732 (CCSU: 92; ECSU: 48; Fairfield: 68; Post: 23; Quinnipiac: 30; Sacred Heart: 47; U of Bridgeport: 16; UConn: 161; UHart: 30; UNH: 18; WCSU: 36)
Actuaries	44 (UConn: 44)
Forensic Science	111 (UNH: 111)
Lawyers	513 (Quinnipiac: 125; UConn: 188; Yale: 200)
Paralegal and Legal Assistant	96 (Briarwood: 3; MCC: 19; Naugatuck CC: 22; Norwalk CC: 19; Post: 1; UHart: 21; UNH: 11)
Real Estate Sales Agents	1,148 (mostly public ccs)
Automotive Service Technicians/Mechanics	415 (No detailed info)
Source: [a]CT DOL Office of Research Labor Market Information. www.ctdol.state.ct.us/lmi/misc/mostopen.htm [b]State of Connecticut Department of Higher Education Degree Completions www.ctdhe.org/database/CompletionsPG81.htm#Degree%20level	

Appendix C

Colleges and Universities Located in Connecticut		
College or University	**Location**	**Type**
Albertus Magnus College	New Haven	Independent
Asnuntuck Community College	Enfield	Public
Bais Binyomin Academy	Stamford	Independent
Briarwood College	Southington	Independent For Profit
Capital Community College	Hartford	Public
Central Connecticut State University	New Britain	Public
Charter Oak State College	New Britain	Public
Clemens College	Suffield	Independent For Profit
Connecticut College	New London	Independent
Eastern Connecticut State University	Willimantic	Public
Fairfield University	Fairfield	Independent
Gateway Community College	New Haven	Public
Goodwin College	East Hartford	Independent
Graduate Institute, The	New London	Independent
Hartford Seminary	Hartford	Independent
Holy Apostles College and Seminary	Cromwell	Independent
Housatonic Community College	Bridgeport	Public
Legion of Christ College of Humanities	Cheshire	Independent
Lyme Academy College of Fine Arts	Old Lyme	Independent
Manchester Community College	Manchester	Public
Middlesex Community College	Middletown	Public
Mitchell College	New London	Independent
Naugatuck Valley Community College	Waterbury	Public
Northwestern Connecticut Community College	Winsted	Public
Norwalk Community College	Norwalk	Public
Paier College of Art	Hamden	Independent For Profit
Post University	Waterbury	Independent For Profit
Quinebaug Valley Community College	Danielson	Public
Quinnipiac University	Hamden	Independent
Rensselaer at Hartford	Hartford	Independent
Sacred Heart University	Fairfield	Independent
Saint Joseph College	West Hartford	Independent
Southern Connecticut State University	New Haven	Public
St. Basil College	Stamford	Independent
St. Thomas Seminary	Bloomfield	Independent
St. Vincent's College	Bridgeport	Independent
Talmudic Institute of Connecticut	Bridgeport	Independent
Three Rivers Community College	Norwich	Public
Trinity College	Hartford	Independent
Tunxis Community College	Farmington	Public
United States Coast Guard Academy	New London	Public
University of Bridgeport	Bridgeport	Independent
University of Connecticut - Health Center	Farmington	Public
University of Connecticut - Law School	Hartford	Public
University of Connecticut, Avery Point	Groton	Public
University of Connecticut, Stamford	Stamford	Public

Colleges and Universities Located in Connecticut		
College or University	**Location**	**Type**
University of Connecticut, Storrs Campus	Storrs	Public
University of Connecticut, Tri-Campus	Torrington, Waterbury, West Hartford	Public
University of Hartford	West Hartford	Independent
University of New Haven	West Haven	Independent
Wesleyan University	Middletown	Independent
Western Connecticut State University	Danbury	Public
Yale University	New Haven	Independent
Source: DHE		

Appendix D

Technical High Schools

The State Board of Education operates the Connecticut Technical High School System through the state Department of Education. There are 17 schools, two satellite facilities, and one technical educational center. The schools dropped the word “vocational” and are called technical schools, although this name has not been codified in statute.

State law (C.G.S. Sec. 10-95) allows the State Board of Education to establish a statewide system of regional vocational-technical schools to offer programs in "vocational, technical and technological education and training." The commissioner of education is authorized to oversee management of the system in accordance with the policies established by the state board. State vocational-technical schools in Connecticut date back to 1910, when the first two trade schools were established in Bridgeport and New Britain.

Day-to-day oversight of the technical school system is the responsibility of a superintendent of schools, who answers to the commissioner of education and a subcommittee of the state board, known as the Technical School Committee.

The state's regional technical school system offers 26 different secondary-level trade programs. Programs for adults are available in the health services field (LPN, dental assisting, certified nurse’s aide, medical assistant, and surgical technology), and in aviation maintenance technology. Some secondary programs are available at every school; others are available at just a few schools or only at satellite facilities.

From year to year, the trade programs offered within the technical school system may change. The introduction of a new program to the system or the elimination of an existing program is under the jurisdiction of the State Board of Education. A change in the specific schools offering an existing program can be made by the superintendent of the regional technical school system.

Since 1990, the State Board of Education has been required by C.G.S. Sec. 10-95i(b) to evaluate existing trade programs at least every five years on the basis of:

- *projected employment demand* for students enrolled in the program;
- anticipated technological changes;
- availability of qualified instructors;
- existence of similar programs at other educational institutions; and
- student interest in the program.

Following the evaluation, programs can be reauthorized for periods of up to five years.

Graduation rates. Table D-1 provides a statewide snapshot of technical school graduates and their future plans. The table also breaks down graduates by the type of technical school program they selected to concentrate in. There were a total of 2,185 graduates of which 41 percent planned on enrolling in postsecondary school.

Table D-1. 2007-2008 Technical School Graduates by Program and Future Plans				
Program	**Number Graduates**	**% Pursuing Education**	**% in Military**	**% Available for Employment**
Auto Body Repair	109	29.4	4.6	60.6
Automotive Mechanic	219	41.1	5.0	51.1
Baking	17	52.9	5.9	35.3
Bioscience Environmental Technology	13	76.9	0	23.1
Carpentry	170	38.8	5.3	55.3
Culinary Arts	225	63.6	3.6	28.4
Diesel Mechanics Technology	15	40.0	6.7	53.3
Drafting: Architectural	34	70.6	2.9	23.5
Drafting: Machine	109	61.5	4.6	33.0
Early Care and Education	10	90.0	0.0	10.0
Electrical	226	25.7	3.5	69.9
Electromechanical	37	54.1	8.1	35.1
Electronics	117	65.8	2.6	30.8
Fashion Technology	55	87.3	0.0	10.9
Graphic Communication	63	54.0	6.3	36.5
Hairdressing/Barbering/Cosmetology	188	43.6	3.7	47.9
Health Technology	33	66.7	0.0	33.3
Heating/Ventilation/Air Conditioning	125	21.6	4.8	68.8
Hotel/Hospitality Technology	19	89.5	0.0	10.5
Information Support and Services	20	95.0	0.0	5.0
Interactive Media	6	50.0	0.0	50.0
Manufacturing Technology	125	38.4	1.6	53.6
Masonry	34	47.1	8.8	44.1
Microcomputer Software Technician	57	80.7	1.8	14.0
Plumbing and Heating	150	20.0	6.7	72.7
Welding	9	55.6	0.0	44.4
Total	2,185			
Source: Connecticut Technical Schools				

Pursuit of postsecondary education. The proportion of technical school graduates pursuing postsecondary education has increased greatly since the 1980s. In 1985, only 18 percent of the graduates were in this category. By 1995, it was 27 percent; it grew to 37 percent in 2004, and in 2007, it increased again to 41 percent.

Many graduating classes attend a mix of two-year or four-year schools. Table D-2 compares the number of 2002 and 2007 graduates attending college by enrollment in two or four year colleges. Although the majority of technical high school graduates enrolled in two year colleges for both years examined, the number and percent of students enrolling in four year colleges is growing – from 33 percent in 2004 to 39 percent in 2007. Some students earn college credit while attending technical high schools.

Table D-2. College Bound Technical HS Graduates				
Type of College	**2004**		**2007**	
	Number	**Percent**	**Number**	***Percent***
2 Year College	490	67%	547	61%
4 Year College	241	33%	356	39%
Total	731	100%	903	100%
Source: Connecticut Technical High Schools				

College Career Pathways (CCP) program. The College Career Pathways (CCP) program is a course of study intended to encourage and prepare high school and technical high school students to pursue an associate or baccalaureate degree in their chosen technical areas. The program begins for high school students at the end of their second year. Students in the 10th grade apply to the program by submitting a special application available through their guidance counselors; these courses are part of their school requirements and are taken at their high schools.

The course pathway toward the degree or certificate, beginning in high school, is a coherent sequence and does not require repetition of the same learning outcomes. To be considered a complete curriculum, high school coursework must include math, communications, science, and a career subject (e.g., accounting and architectural drafting).

Up to 14 college credits may be earned by the end of the senior year of high school. Students formally enroll in a community college and register for articulated academic and technical courses. In order to be eligible for the program, a student must:

- have completed a planned sequence of academic courses (English, math, and science) and a technical program in 9th and 10th grade;
- achieve an overall C+ or higher average in 10th grade;
- have at least 11th grade standing; and
- have parental permission.

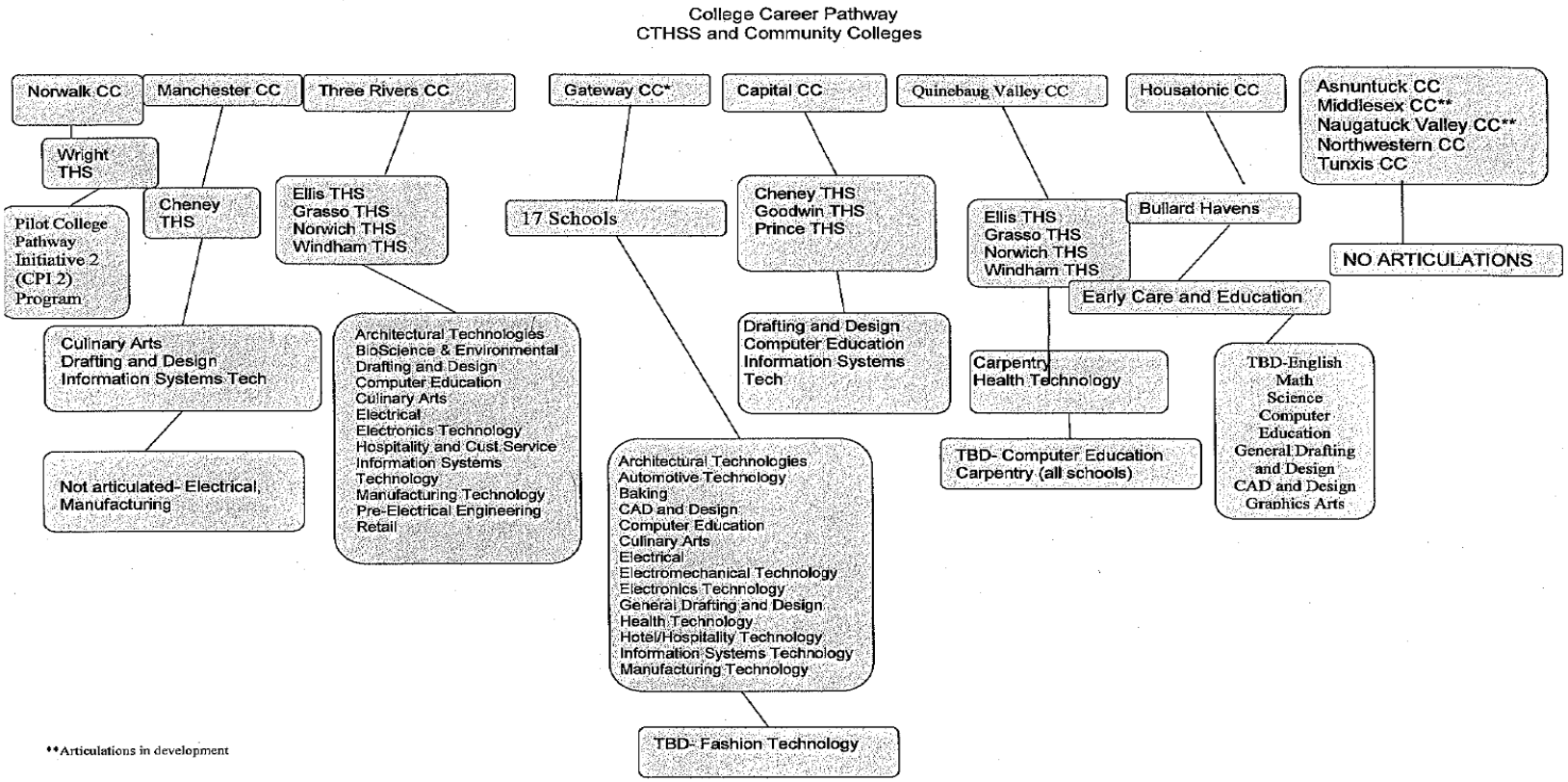
Articulation agreements with community colleges. Figure D-1 shows articulation agreements that the technical schools have with the community colleges. Five of the 12 community colleges do not have articulation agreements signed, although they are in development for two schools. The trade/technology programs with formally established course credit pathways with designated community colleges include:

- Architectural Technologies;
- Automated Manufacturing, Automotive;
- Bioscience and Environmental Technology;
- Carpentry;
- Computer-aided Drafting and Design;
- Culinary Arts;
- Early Care and Education;

- Electrical;
- Electronics;
- Electromechanical;
- General Drafting and Design;
- Health Technology;
- Tourism, Hospitality and Guest Service Management;
- Information Systems Technology;
- Manufacturing Technology;
- Pre-Electrical Engineering and Audio Visual Technology; and
- Retail Management and Entrepreneurship.

These articulation agreements may result in an even greater proportion of technical high school graduates pursuing postsecondary education.

Figure D-1



Source: Connecticut Technical High Schools

Appendix E

REPORTS AND STUDIES FROM THE OFFICE FOR WORKFORCE COMPETITIVENESS

At various times, OWC has been asked by the Governor and the legislature to study various issues involving the workforce and the economic and technological changes that affect the state's economic competitiveness. OWC is also responsible for the production of various national and state reports on behalf of the Connecticut Employment and Training Commission and others. A listing of OWC publications and reports is provided below.

Workforce Investment Act: State Five Year Implementation Plan, (Connecticut Employment and Training Commission (CETC)/Office for Workforce Competitiveness (OWC)/CT Department of Labor (CTDOL), January 2001).

An Information Technology Workforce Strategy for the State of Connecticut**,** (CETC/OWC, January 2001).

Workforce Investment Study Team Report (WIST), (OWC, January 2001).

New England's Information Technology Workforce Challenge: Strengthening the Region's Economic Competitiveness**,** (OWC, February 2001).

Strategic Vision for Information Technology Workforce Development in Connecticut, (CETC/OWC, January 2002).

Connecticut Career Choices: The Federal School-to-Career Experience in Connecticut and Recommendations for the Future**,** (OWC, February 2002).

Final Report of the Governor's Task Force on the Future of the Regional Vocational-Technical High School System, (OWC, January 2003).

A Progress Report on Technology Workforce Development in Connecticut, (CETC/OWC, February 2003).

JOBS 2010: A Look at Connecticut's Workforce Needs Over the Coming Decade, (OWC/CERC, March 2003).

The Northeast Research and Education Network (NEREN): Developing a High Speed "Digital Highway" for Research and Education for the Northeast Region, (OWC, July 2003).

Connecticut Workforce Demands and the Implications for Education, (CTDOL/OWC, July 2003).

Ad Hoc Task Force Report on Connecticut Works System, (CETC/OWC, September 2003).

New England Governors' Conference Report: Improving the Region's Technology Position – Four regional Action Strategies**,** (OWC, September 2003).

Generating the Talent and Innovations for the 21st Century Knowledge Economy, (OWC, December 2003).

Connecticut Employment and Training Commission (CETC) Annual Reports, (OWC, 2000 -2004).

Connecticut Career Ladder Advisory Committee Three Year Strategic Plan, (OWC, February 2004).

Generating the Talent and Innovations for the 21st Century Knowledge Economy: a Report on Connecticut's Technology Preparedness, (OWC, February 2004).

2003 Report Card for Employment and Training Programs: Covering Programs July 1, 1998-June 30, 2003 (CETC/OWC, June 2004).

Connecticut's Broadband Infrastructure: a Distinct Competitive Advantage, (OWC, July 2004).

Demographics and Economics in Connecticut: A Collision in the Making? (PPT), (OWC, July 2004).

Building Upon Connecticut's Core Competencies in the Knowledge Economy: A Case Statement for Meeting the Challenges of the 21st Century Knowledge Economy, (OWC, April 2005).

Building an Allied Health Workforce Pipeline for the Greater Waterbury Region, (OWC, April 2005).

A Call to Action: Advancing Nanotechnology Development in Connecticut, (OWC, May 2005).

State of Connecticut Strategic Two-Year State Workforce Investment Plan: July 1, 2005 – June 30, 2007, (OWC/CTDOL June 2005).

The Real Cost of Living in 2005: The Self-Sufficiency Standard for Connecticut, (OWC, December 2005).

Allied Health Workforce Policy Board: 2005 Legislative Report, (OWC, January 2006).

Final Report: Recommendations to Advance Connecticut's Position in Nanotechnology Development, (OWC, February 2006).

Career Ladder Advisory Committee: Pilot Project Update, (OWC, February 2006).

Allied Health Workforce Policy Board: 2006 Legislative Report, (OWC, January 2007).

Nursing and Allied Health Faculty Staffing Plan, Allied Health Workforce Policy Board, (January 2007).

A Talent-Based Strategy to Keep Connecticut Competitive in the 21st Century, (OWC, February 2007).

Career Ladder Advisory Committee: Pilot Project Update, (OWC, February 2007).

Advancing Connecticut in Nanotechnology Development: A Report on Ongoing Activities and a Call for Future Investments, (OWC, April 2007).

Connecticut Employment and Training Commission (CETC) CETC Annual Plan, (OWC, 2000 - June 2007).

Clinical Placement Capacity Assessment Project Report, (Allied Health Workforce Policy Board, July 2007).

Data Interoperability Initiative – Data Sharing Resource Guide, *OWC/Public Consulting Group*, Fall 2007.

Connecticut's Framework for Positive Youth Development, (Youth Futures Committee, January 2008).

Allied Health Workforce Policy Board: 2007 Legislative Report, (OWC, January 2008).

Career Ladder Advisory Committee: Pilot Project Update, (OWC, February 2008).

Connecticut Centers for Nanoscale Sciences: Investing in Institutionally-Based, Shared-Use Nanotechnology Facilities for Research, Education and Product Development, (OWC, February 2008).

Allied Health Workforce Policy Board: 2008 Legislative Report, (OWC, January 2009).

Career Ladder Advisory Committee: Pilot Project Update, (OWC, January 2009).

Appendix F
Connecticut Community College System Provision of Child Care Services

Asnuntuck CC - Children's Reading Room Capacity: not provided Wait List: No. Children Age Range: 3 years and older	Open for Summer Semester? No Operating Days: Monday-Thursday Operating Hours: 8:30 AM – 3:30 PM Cost: Free to Students/Faculty & Staff
Capital CC – Elaine Steward McKirdy Laboratory School at Capital Community College Capacity: 22 Wait List: Y/N Yes. If yes, how many? 8 Children Age Range: 3 years and 4 year olds	Not open for Summer Semester only academic semesters. Operating Days: not provided Operating Hours: not provided Cost: Student's child fee: $2.50 per hour Faculty member's fee: $3.50 per hour Public fee: $4.00 per hour
Gateway CC – The Early Learning Center Capacity: not provided Wait List: Yes If yes, how many? 50 Children Age Range: 3-5 (pre-K)	Open for Summer Semester? Yes. Have a separate summer camp program for children enrolled during school year. Operating Days: Monday - Friday Operating Hours: 7:30 AM – 5:30 PM Cost: Student's child fee: $115 Full-time; $60 M,W,F; or $60 T, R Community: $165 Full-time care; $115 M,W,F; or $85 T, R
Housatonic CC – Early Childhood Laboratory School Capacity: 47 Wait List: Yes If yes, how many? 78 Children Age Range: Pre-school aged, 3 & 4 year olds	Open for Summer Semester? Yes. One room, 24 slots. Operating Days: Monday - Friday Operating Hours: 7:30 AM – 5:30 PM Cost for Students: Sliding scale based on income and number in family for Bridgeport residents who are part of the Bridgeport School Readiness Child Care Grant. Community: $5.00 per hour
Manchester CC – Child Development Center Capacity: 24 Wait List: No Children Age Range: 3 – 5 year olds. Children 2.9 in September are eligible.	Not open for Summer Semester. Operating Days: Monday - Friday Operating Hours: M-R (9AM – 4 PM; F: 9AM – 12 PM Cost - Students: $21 per day/$10.50 per half day Staff/Faculty: $27 per day; $13.50 per half day Community: $31 per day; $15.50 per half day
Middlesex CC – Middlesex Community College Childcare and MxCC Preschool Center Capacity: 24 Wait List: Yes. If yes, how many? 6 at both locations Children Age Range: 2 years 10 months – five years old.	Campus site is open for summer semester; Operating Days: Monday - Friday MxCC Preschool Operating Hours: M,T, W, R: 7:45 AM – 3:45 PM; F: 7:45 AM – 1:45 PM Cost: Non-readiness families at campus site are $20 for AM & $15 for PM. MxCC Preschool at Macdonough School Operating Hours: M- F 8 AM – 3:45 PM Cost: Sliding scale Not open for summer semester. Students/Public fee is $6,000 year.

Appendix F
Connecticut Community College System Provision of Child Care Services

Naugatuck Valley CC – Naugatuck Valley Child Development Center The Discovery School is collaboration between NVCC and the Waterbury Public School Pre-K Program. Capacity: 48 Wait List: Yes. If yes, how many? 129 15 of these children are waiting for school readiness. Children Age Range: 1 toddler program for 8 children; 1 pre-school class of 20 children	The School Readiness Grant Program is open for Summer Semester. The Discovery School is open year round. Operating Days: NVCDC – Mondays – Fridays Operating Hours: Monday - Thursday 8 – 4 PM ; Friday: 8 - Noon Cost: Students/Faculty/Community $24.00 per day Operating Days: School Readiness/Discover School—Mondays – Fridays Operating Hours: 7:30 AM – 5:30 PM for Waterbury residents. Fees determined on a sliding scale. Max. per week is $135. For the second preschool the cost is $12 per half day; $24 per full day until 4 PM; The toddler program cost is $14 per half day, or $28 per full day until 4 PM. The second preschool classroom and the toddler classroom are open Monday-Thursday from 7:30 – 4 PM and Fridays from 7:30 – Noon and are open with the college calendar.
Northwestern CC – NCCC ECE Lab School/Child Development Center Capacity: 20 Wait List: Yes. If yes, how many? 2 2 – 5 year olds.	Not Open for Summer Semester. Operating Days: Monday - Friday Operating Hours: 7:45 AM – 5 PM Full & Half day fees for Community, Staff, & Students
Norwalk CC –Kathryn Croaning Child Development Laboratory School Capacity: 44 Wait List: Yes. If yes, how many? 75 on waiting list (51 on the list are infant/toddlers 6 months – 3 years old). Age range: 6 months – 5 years	Not open for Summer Semester. Operating Days: Monday – Friday Operating Hours: 8 AM – 3 (M – R); 8AM – Noon (F) School Readiness (3 – 5 year olds) M-F 8 AM – 3 PM Cost: $6 per hour minimum of 14 hours per week (Tuesday & Thursday); maximum of 32 hours (M-F) $8/hour for Faculty $10/hour for public
Quinebaug Valley CC – Steppingstones Early Learning Center Capacity: 32 Wait List? Yes. 20	Open for Summer Semester? Yes. Operating Days – Monday - Friday Operating Hours: 7:30 – 5:30 PM Sliding Scale: No Cost: Student's Child , Faculty , Staff & Community: $12 half day/$24 full day
Three Rivers CC – The Child Development Center at Three Rivers Community College Capacity: 38 No Waiting List at this time. Age Range will serve infants through preschool age children.	To be opened on campus Spring 2010. The Center will be open year round. Operating Days: Monday – Friday Operating Hours: 7:30 am – 5:30 pm. The fees will be determined by the vendor.
Tunxis CC – The Early Childhood Center Lab School Capacity: 37 Wait List: No waiting list at this time. Age Range: 3 to 5 year olds	Open September through June (not open in the summer). Days of Operation – Monday through Fridays Hours of Operation: Monday -Thursday 8 AM – 4 PM & Friday: 8 AM – 1 PM Cost: Students pay $3 per hour Staff/Community pay $6.50 hour
Source: Connecticut Community College System, November 2009	

Appendix G

ARRA Green Grants Awarded to or Pending for Connecticut as of December 2009	
Grant	**Purpose/Description**
State Energy Program (SEP) • $38,542,000 • U.S. Dept. of Energy • Approved: 4/1/09-3/31/12	• Funding will be used to provide financial incentives for a variety of specific energy efficiency (EE) programs to address improvements in residential, commercial, institutional and industrial buildings • Primary activities would include "equipment replacement, installation, or modification" • Funding will also be used to incentivize "renewable" energy (RE) in the areas of geothermal heat pumps, solar photovoltaic, fuel cell, and solar thermal (include equipment installation and modification) • Some funds will support the Department of Energy's clean cities coalitions • A small portion of the funds will be used for the training of building operators and for training of building officials
DSS Weatherization Assistance Program $64,310,502 U.S. Dept. of Energy Approved: 4/1/09-3/31/12	• The State will use existing community action agency (CAA) network, as well as other entities, to operate the ARRA WAP: o Action for Bridgeport Community Development, Inc. (ABCD) – Bridgeport o The Community Renewal Team, Inc. (CRT) – Hartford & Middletown o New Opportunities, Inc. – Waterbury and Meriden, New Haven service area o The ACCESS Agency, Inc. – Willimantic o CT DECD • DECD will provide ARRA weatherization services to state public rental housing units throughout the state • 7,500 units will be weatherized • Training and Technical Assistance will be used for: o Statewide lead safe training on new DOE minimum standards o Energy auditor certification training class (CSG) o On-site training for crews, energy auditors and subcontractors o Mold and moisture detection training o Annual combustion safety refresher training o Client education training o OSHA training for new staff and subcontractors • The two-week core competency training is designed includes courses in basic competencies, safe work practices, building evaluation, measure installation, final inspection, consumer education, monitoring, program management and training • In addition Crew Worker, Crew Chief, Inspector, Monitor and Auditor certifications and requirements are designed as on-the-job training as well as one- to two-day courses • In response to the expected demand for more trained auditors to handle the increased number of units that will be weatherized, DSS has already scheduled two auditor certification classes for June and September 2009 on the Nome Check Energy Audit (the only audit currently approved by DOE for use in CT)

Grant	Purpose/Description

Energy Efficiency & Conservation Block Grant
$24,522,900
U.S. Dept. of Energy
Approved: 8/1/09-7/31/12
	• 90% of grant will be used to provide sub-grants to 143 units of local government that are not eligible for direct formula grants
	• Projects have to be consistent with State of CT's energy policy framework (C.G.S. Sec. 16a-35k) and Governor Rell's Connecticut Energy Vision Plan
	  o Under this framework, CT has established energy efficiency, conservation, renewable and green house gas reduction goals that include:
	  ▪ A 20% reduction in electric-peak grid consumption by 2020
	  ▪ A 20% reduction in fossil fuel consumption by 2020
	  ▪ Commercial transportation fuels to include a mixture of 20% alternative fuels by 2020
	  ▪ Residential and commercial heating oil to include a mixture of 20% alternative fuels by 2020
	  ▪ By 2020, a 10% reduction in GHG (greenhouse gas) emission as compared to 1990 levels
	  ▪ By 2050, an 80% reduction in GHG emissions as compared to 2001 levels
	• 10% of grant will be used to provide competitive sub-grants to towns that partner with other towns to implement projects that will be of a regional benefit

SOAR (Sustainable Operations: Alternative and Renewable Energy Initiative)
$2,000,000
U.S. Dept. of Labor
Approved: 2/15/09-2/14/12
	• Creates eight credit certificate programs, 24-30 credits each
	  1. Sustainable Facilities Management (Three Rivers cc)
	  2. Sustainable Landscape Ecology & Conservation Technician (Three Rivers cc)
	  3. Building Efficiency & Sustainable Technologies Certificate/Sustainable Facilities Management (Norwalk cc)
	  4. Alternative Energy Transportation (Gateway cc)
	  5. Clean Water Treatment (Gateway cc)
	  6. Solar Energy Technologies (Gateway cc)
	  7. Alternative Energy Systems (Naugatuck Valley cc)
	  8. Sustainable Energy Certificate (Manchester cc)
	• #1 and #2 started Fall 09; #3-8 to begin Spring '10
	• Five Regional Program Coordinators will:
	  1. facilitate recruitment, retention, completion and job placement
	  2. offer academic and career counseling and case management services
	  3. work in partnership with One-Stops, high schools and community organizations to raise awareness of emerging career pathways
	  4. forge connections with regional alternative and renewable energy employers and assist with outcomes tracking
	• 320 students will earn a CCCS Sustainable Operations Certificate in one of the eight areas
	  1. 85% of SOAR students will enter employment
	  2. Regional Coordinators will work with 900 clients/students, train 350 One-Stop and high school counselors
	  3. 20 college instructors will receive professional development training, and will train 800 students annually
	  4. 1,500 people will benefit from SOAR capacity-building activities

Grant	Purpose/Description

SMART (Skills for Manufacturing and Related Technologies) Initiative
$2,191,400
U.S. Department of Labor
Approved: 4/1/08-3/30/11
	• 12 community colleges jointly developed SMART to provide a systemwide response to CT's manufacturing workforce challenges
	• The Regional Center for Next Generation Manufacturing, strengthens career pathways through the CCCs College of Technology (a "virtual college")
	• CT Center for Advanced Technology serves as a lead partner; also involves SDE (including technical high schools), CBIA, WIBs
	• Program targets adult ed learners, veterans, ethnic minorities, immigrants, young workers aged 18-27, and young women
	• Creates/expands three certificate programs:
	  o Pre-manufacturing certificate program (offered at all 12 CCCS colleges) to improve student success in higher-level programs by increasing skills and academic/career awareness (500 hours, noncredit)
	  o Level One Precision Manufacturing Certificate program (expanded from two colleges to five) with common core competencies, transferable skills and credentials, manufacturing-specific education components, and more extensive work-based learning (600 hours, for credit)
	  o Level Two Precision Manufacturing Certificate program offering specialties in precision machining and CNC technologies, welding technology, and electronics control technology, and featuring a paid internship (18-credits)
	• Outcome to result in 331 CCCS students achieving credentials in the three target certificate programs

Northeast Research Consortium
"Making 'Green' Real" Grant
$3,999,923
($250,000 for CT)
U.S Department of Labor
Approved: 12/1/09-5/31/11
	• Includes 6 New England states plus New York and New Jersey
	• Vermont will lead the consortium and serve as the fiscal agent
	• The consortium will be governed by a steering committee consisting of the eight LMI directors
	• There will be nine research and dissemination task groups:
	  o Defining "green"
	  o Building a "green" coding tool
	  o Real time demand analysis
	  o Short term vacancy projections
	  o The use and extension of current LMI tools
	  o Creation of electronic dissemination tools
	  o Publications
	  o Outreach to local partners
	  o Creation of Green Job Banks
	• Consortium's research and dissemination work to be conducted in four phases:
	  o Creating definitions and coding tools
	  o Demand analysis projections
	  o Use and extension of current LMI tools, data collections and databases
	  o Creation of electronic and other dissemination tools including green job banks

Grant	Purpose/Description
Green Capacity Building Grant YouthBuild Bridgeport, The Workplace, Inc., Bridgeport $59,894 U.S. Department of Labor Approved: 12/1/09-11/30/10	• Intended to build the green training capacity of current DOL grantees • Goal to train 20 students (17-24 years old) currently enrolled in the YouthBuild project to prepare them for careers in emerging energy-efficient green building construction and retrofit industries • Successful completion of the program will qualify graduates for Carpenters Union, Local 210 apprenticeship programs • Will also train five local instructors by trainers from the Home Builders Institute
Green Capacity Building Grant YouthBuild Hartford, Co-Opportunity, Inc., Hartford $69,933 U.S. Department of Labor Approved: 12/1/09-11/30/10	• Intended to build the green training capacity of current DOL grantees • Goal to train 20 students (17-24 years old) currently enrolled in the YouthBuild project prepare for careers in deconstruction (dismantling buildings with goal of preserving reusable materials and reducing landfill needs) • Also certify 2-3 YouthBuild instructors as trainers for deconstruction, and provide internships to 3 YouthBuild students
Pathways Out of Poverty The Workplace, Inc., Southwestern CT's WIB (Bridgeport)) "Green-up Bridgeport" $5 million U.S. Department of Labor **Pending**: Approx. 1/1/10-12/31/12	• Focus on entry level skills in established occupations that are projected to have increased demand • Majority of the jobs do not require a postsecondary university degree, but usually work related experience, short, moderate or long-term on the job training, or postsecondary vocational award • Education and training offered by ECSU, CCSU, Gateway CC, Housatonic CC, Norwalk CC, and University of Bridgeport • Will serve 600 participants in beginning education and training activities

Grant	Purpose/Description
CT Green Jobs Partnership (SESP) $3,360,000 U.S. DOL **Pending**: 1/1//10-12/31/12	• Comes out of Gov. Exec Order #23 • The CT State Energy Sector Plan for grant developed under CETC, under the guidance of the CT Green Jobs Partnership ("The Partnership") o Purpose to implement the strategic workforce plan of the CT Green Jobs Partnership to make the entire state/CT a world leader in the development of a workforce prepared for careers in EE and RE industries and for jobs that clean and enhance the environment—this also positions CT to overcome high energy costs and stimulate economic growth • Competitive grants for worker training and placement in high growth and emerging industry sectors • State Energy Sector Partnership (SESP) and Training Grant • Picks up funding of SOAR Project Director after SOAR Grant expires (Current grant aligning with existing initiative) • Building Analyst Training at the CT Community Colleges, to obtain BPI certification for instructors, equipment, and training of 100 candidates (over three years) • Green Manufacturing –Lean/Green to train 30 to get certificates • Clean Water Technicians (Certification at Wastewater Technician Level III)for 65 between Goodwin and Gateway • Municipal Building Officials Training in RE/EE Inspection for 180 via Institute for Sustainable Energy at ECSU—three half-day workshops for building code officials • Green Jobs Training Incentive Fund to respond to employer needs as part of business incentive package with other financial supports (average of $4,000 per trainee—190 trainees) • SDE will promote need for STEM skills in green jobs for K-12 system and Adult Ed programs • DHE will promote partnership across 4-year colleges, and increase articulation agreements with high schools and community colleges • CT Technical High School System will inform its guidance counselors of partnership processes and opportunities and will work to define programs related to green jobs to be offered at technical high schools • CT Community College System will work to ensure alignment, including SOAR Energy Initiative, weatherization training, and 47 other related programs across the CCCS—they will also work to refine articulation agreements with high schools and four-year colleges • Goodwin College Environmental Studies Department will offer its wastewater management certificate program through the partnership • Institute for Sustainable Energy at ECSU will deliver proposed Municipal Building Officials Training with DPS, and help develop green career ladders for jobs related to energy efficiency in new and existing commercial building • The CT Clean Energy Fund supported the planning process by providing info about initiatives and investments related to clean energy and helping identify key workforce development needs and existing training offerings. CCEF will invest training funds in programs to develop the RE workforce • Will target incumbent workers needing to upgrade their skills to meet new green job function demand (and qualify for advancement/wage increases), and un- and underemployed needing training to secure a job on a green career pathway

Grant	Purpose/Description

***Energize CT!* A Statewide Energy Training Partnership** (CEWD – CT Energy Workforce Development Consortium)
$2,210,800
U.S. Department of Labor
• **Pending**: Approx. 1/1/10-12/31/12
	• Is a public-private consortium of energy related business, academic and government representatives, which develops solutions to meet the workforce needs of energy and energy-related companies
	• CBIA Education Foundation will manage this project/grant
	• Will train 766 workers in three growing occupations:
	  o Solar PV/solar thermal/geothermal installers
	  o Diesel engine mechanics
	  o Energy efficiency building managers

Pathways Out of Poverty (Capital Workforce Partners WIB)
$3,066,880
U.S. Dept. of Labor
Pending: Approx. 1/1/10-12/31/12
	• Purpose to transform and "green" its Hartford Job Funnel, a nationally recognized, highly successful grassroots workforce preparation partnership
	• Will place 350 Hartford residents in jobs in the green construction and sustainable energy generation industries
	• CWP will provide skills training in these fields in addition to math and science refreshers, opportunities to earn a range of postsecondary certificates and degrees, adult basic ed, ESL, GED prep, as needed
	• Four categories identified for this grant:
	  o Unemployed individuals
	  o High school dropouts
	  o Individuals with criminal records
	  o Disadvantaged individuals in high poverty areas
	• Three employer/business partners will identify emerging job opportunities, advise on curriculum selection and revision, and assist with job placement:
	  o CT Center for Advanced Technology (CCAT) (focus on sustainable energy industries such as fuel cells, hydrogen, and renewables)
	  o CT Construction Industry Association/Associated General Contractors of CT (CCIA/AGC)
	  o Minority Construction Council (MCC)
	• CCSU's Institute for Technology and Business Development (ITBD) will develop a 90-minute orientation to the emerging green economy for use with all participants, and a week-long introduction to sustainable energy generation
	• Other postsecondary institutions will provide green-focused certificate and degree programs that participants will access via individual training accounts (ITAs) leveraged through CWP
	• Three labor partners will contract to provide green construction training and assist with subsequent placements:
	  o New England Laborers' Training Academy
	  o Ironworkers Local #15 Apprenticeship Program
	  o Finishing Trades Institute of Southern New England (FTISNE)
	• Participants will have support from a designated case manager employed by one of the CBO partners

Source: PRI staff analysis of federal green grant applications	

Appendix H

Green Occupations as Identified by the Connecticut Department of Labor		
Management • General and Operations Managers • Administrative Services Managers • Industrial Production Managers • Farmers and Ranchers • Construction Managers • Engineering Managers • Natural Sciences Managers	**Business and Financial Operations** • Purchasing Agents and Buyers, Farm Products • Cost Estimators • Management Analysts • Meeting and Convention Planners • Business Operations Specialists, All Others	**Computer and Mathematical Science** • Computer Software Engineers, Applications • Computer Software Engineers, Systems Software • Operations Research Analysts
Architecture and Engineering • Architects, Except Landscape and Naval • Landscape Architects • Agricultural Engineers • Chemical engineers • Civil Engineers • Electrical Engineers • Electronics Engineers, Except Computer • Environmental Engineers • Mechanical Engineers • Architectural and Civil Drafters • Environmental Engineering Technicians **Sales and Related** • Sales Representatives, Wholesale and Manufacturing	**Life, Physical, and Social Science** • Soil and Plant Scientists • Conservation Scientists • Foresters • Atmospheric and Space Scientists • Chemists • Environmental Scientists and Specialists, Including Health • Geoscientists, Except Hydrologists and Geographers • Hydrologists • Urban and Regional Planners • Chemical Technicians • Environmental Science and Protection Technicians, Including Health • Forest and Conservation Technicians	**Legal** • Lawyers **Education, Training, and Library** • Farm and Home Management Advisors **Arts, Design, Entertainment, Sports, and Media** • Commercial and Industrial Designers **Healthcare Practitioner and Technical** • Occupational Health and Safety Specialists **Protective Services** • Fish and Game Warden
Building and Grounds Cleaning and Maintenance • Janitors and Cleaners, Except Maids and Housekeeping Cleaners • Landscaping and Groundskeeping Workers • Tree Trimmers and Pruners	**Office and Administrative Support** • Customer Service Representatives • Couriers and Messengers • Dispatchers, Except Police, Fire and Ambulance • Production, Planning , and Expediting Clerks • Shipping, Receiving and Traffic Clerks • Executive Secretaries and Administrative Assistants • Secretaries, Except Legal, Medical, and Executive • Office Clerks, General	**Farming, Fishing, and Forestry** • First-Line Supervisors/Managers of Farming, Fishing and Forestry Workers • Agricultural Inspectors • Farmworkers and Laborers, Crop, Nursery, and Greenhouse • Farmworkers, Farm and Ranch Animals • Forest and Conservation Workers

Appendix H

Construction and Extraction	Installation, Maintenance, and Repair	Production
• First-Line Supervisors/Managers of Construction Trades and Extraction Workers • Boilermakers • Carpenters • Cement Masons and Concrete Finishers • Construction Laborers • Paving, Surfacing, and Tamping Equipment Operators • Pile-Driver Operators • Operating Engineers and Other Construction Equipment Operators • Electricians • Glaziers • Insulation Workers, Floor, Ceiling, and Wall • Plumbers, Pipefitters, and Steamfitters • Roofers • Sheet Metal Workers • Structural Iron and Steel Workers • Helpers-Carpenters • Helpers-Electricians • Construction and Building Inspectors • Hazardous Material Removal Workers • Rail-Track Laying Maintenance Equipment Operators **Transportation and Material Moving** • Bus Drivers, Transit and Intercity • Truck Drivers, Heavy and Tractor-Trailer • Locomotive Engineers • Railroad Conductors and Yardmasters • Subway and Streetcar Operators • Crane and Tower Operators • Industrial Truck and Tractor Operators • Laborers and Freight, Stock, and Material Movers, Hand • Refuse and Recyclable Material Collectors	• First-Line Supervisors/Managers of Mechanics, Installers, and Repairers • Electrical and Electronics Repairers, Commercial and Industrial Equipment • Automotive Service Technicians and Mechanics • Bus and Truck Mechanics and Diesel Engine Specialists • Bicycle Repairers • Heating, Air Conditioning, and Refrigeration Mechanics and Installers • Industrial Machinery Mechanics • Maintenance and Repair Workers, General • Millwrights • Electrical Power-Line Installers and Repairers • Helpers-Installation, Maintenance, and Repair Workers • Installation, Maintenance, and Repair Workers, All Others	• First-Line Supervisors/Managers of Production and Operating Workers • Electrical and Electronic Equipment Assemblers • Engine and Other Machine Assemblers • Structural Metal Fabricators and Fitters • Team Assemblers • Computer-Controlled Machine Tool Operators, Metal and Plastic • Cutting, Punching, and Press Machine Setters, Operators, and Tenders • Machinists • Welders, Cutters, Solderers, and Brazers • Printing Machine Operators • Cabinetmakers and Bench Carpenters • Water and Liquid Waste Treatment Plant and System Operators • Chemical Plant and System Operators • Plant and System Operators, All Other • Chemical Equipment Operators and Tenders • Separating, Filtering, Clarifying, Precipitating, and Still Machine Operators • Mixing and Blending Machine Setters, Operators, and tenders • Inspectors, Testers, Sorters, Samplers, Weighers
Source: Plan to Develop Green Industries and Green Jobs in Connecticut. Prepared by the Departments of Labor and Economic and Community Development, June 2009		

Appendix I

Emerging Occupations in the Green Collar Field	
• Power Purchaser & Carbon Trader	• CHP (combined heat and power) Installers and Operators
• Renewable Energy Site Assessor	• Ice Storage Technician
• Geothermal Assessment Specialist	• Biofuel Processing Technician
• Tradesmen and Supervisors for Energy Efficiency Construction	• Fuel Cell Technician
• Renewable Energy Systems Installer	• Sustainability Coordinator
• Building Automation Specialist	• Advanced Transportation Systems Technician
Source: Presentation by William Leahy, Director of the Institute for Sustainable Energy at Eastern Connecticut State University, *Preparing Connecticut's Workforce for Green Collar Jobs*, EPA Technical Forum, February 24, 2009	

Appendix J

Information on Number of Connecticut Residents Working in Green Industries

Connecticut DOL estimates. The Connecticut DOL estimates the number employed in various green jobs by counting, regardless of occupation, the number employed in a green industry, based on whether the North American Industry Classification System (NAICS) manual defines the particular industry as producing a product or service that contributes directly to preserving and enhancing the quality of the environment. Using this definition, there were 22,373 Connecticut residents working in green industries (Table J-1). Staff from the Connecticut DOL said while the greatest numbers of green jobs in Connecticut are currently in waste management and remediation, the most lucrative jobs are in hydroelectric power generation.[75]

Table J-1. Estimated Number Employed in 2007 in Connecticut's Green Industries

Industry	Estimated Number Employed in 2007
Waste management and remediation services	7,168
Research & development in biotechnology	2,452
R&D in physical, engineering, & life sciences	2,369
Water supply and irrigation systems	2,231
Administration of environmental programs	1,389
Recyclable material merchant wholesalers	1,006
Environmental consulting services	978
Other technical consulting services	720
Nature parks and other similar institutions	637
Sewage treatment facilities	631
Environment and conservation organizations	540
Zoos and botanical gardens	418
Air purification equipment manufacturing	258
Hydroelectric power generation	139
Geophysical surveying and mapping services	25
Other[a]	1,412
Total	**22,373**

[a]Includes nuclear electric power generation, other electric power generation, steam and air-conditioning supply, and ethyl alcohol manufacturing.
Source: Office of Research, Connecticut Department of Labor, December 2008 Economic Digest

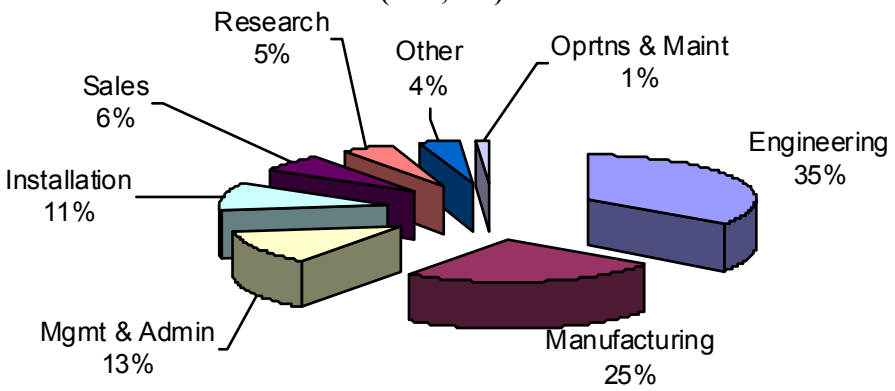
Estimate of green collar jobs based on their contribution to renewable energy and energy efficiency. In addition to the Connecticut DOL projections, a recent study by Navigant Consulting, Inc., also estimates types of Connecticut green jobs in renewable energy and energy efficiency areas. Commissioned by the Connecticut Clean Energy Fund, working in partnership with the Connecticut Energy Efficiency Fund and the Department of Economic and Community Development, the purpose of the three-phase Navigant study was to identify effective ways to support and accelerate growth of the RE/EE industry in Connecticut. The goal of the first phase

[75] Quoted in March 2, 2009 Hartford Courant article, *Green-collar Jobs: Two Rell Directives Would Create Environmentally Oriented Projects*.

of the study was to estimate jobs, employment income, and revenue of renewable energy and energy efficiency companies operating in Connecticut.

Figure J-1 shows 60 percent of the 1,691 renewable energy (RE) jobs are in engineering and manufacturing.

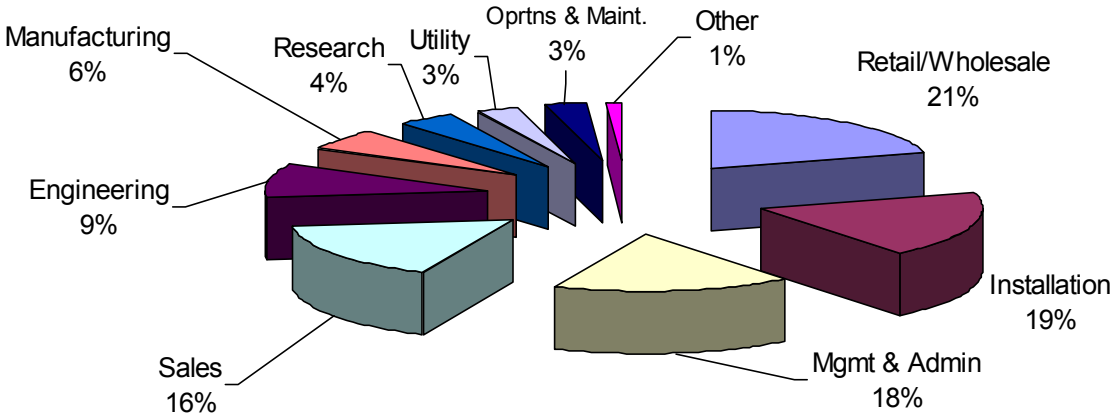
Figure J-1. Renewable Energy (RE) Jobs by Job Type in Connecticut (N=1,691)



Source: CT Renewable Energy/Energy Efficiency Economy Baseline Study, Navigant Consulting, Inc.

On the other hand, the 2,675 energy efficiency (EE) jobs are found primarily in retail/wholesale, installation, management and administration, and sales (Figure J-2).

Figure J-2. Energy Efficiency (EE) Jobs by Job Type in Connecticut (N=2,675)



Source: CT Renewable Energy/Energy Efficiency Economy Baseline Study, Navigant Consulting,

The Navigant baseline study also developed low and high estimates of the number employed in green industry segments using the REMI model[76] and data from the Connecticut DOL. The largest number of jobs is in the electrical equipment and appliance manufacturing segment, with sizable numbers of jobs also found in wholesale trade and construction (Table J-2). These estimates represent less than one percent of the Connecticut workforce (0.27 percent); however, there is potential for double digit growth as the U.S. RE/EE industry expands as expected despite the current economic downturn. Most of Connecticut's energy efficiency jobs are in the service sectors (2,137 jobs), and renewable energy jobs primarily in the fuel cell sector (1,200 jobs). The fuel cell and solar industries, for example, are expected to account for 89 percent of the renewable energy jobs in Connecticut (71 percent and 18 percent, respectively).

Table J-2. Number Employed in Connecticut RE/EE Industry Segments in 2007

Industry	Total # of CT Jobs	Estimate of # of RE/EE Jobs		Percent of CT Industry that are RE/EE Jobs
		Low est.	High est.	
Electrical equipment and appliance manufacturing	4,464	1,530	1,867	34%-42%
Wholesale trade	7,340	470	824	6%-11%
Construction	16,870	313	805	2%-5%
Retail trade	5,814	390	577	7%-10%
Machinery manufacturing	3,314	270	564	8%-17%
Plastics and rubber products manufacturing	381	191	267	50%-70%
Fabricated metal product manufacturing	584	161	251	28%-43%
Nonmetallic mineral product manufacturing	360	113	192	31%-53%
Computer and electronic product manufacturing	2,601	89	174	3%-7%
Waste management and remediation services	411	80	169	19%-41%
Professional and technical services	720	36	101	5%-14%
Wood product manufacturing	74	19	36	26%-49%
Forestry and logging; fishing, hunting, and trapping	10	1	3	10%-30%
Total	**42,943**	**3,663**	**5,830**	**8%-14%**

Source: *Connecticut Renewable Energy/Energy Efficiency Economy Baseline Study*, Navigant Consulting, Inc.

[76] The REMI model is well-known economic analysis tool developed by Regional Economic Models Inc.

Appendix K

LEED Certified Buildings in Connecticut as of November 2009			
Project Name	**Owner**	**City**	**LEED Rating**
401 Merritt 7 Corporate Park	Albert D Phelps as Managing Agent for Me	Norwalk	Silver
Aetna Customer Center	Aetna	Hartford	Silver
Amistad Street Building	YSM Facilities, Construction & Renovation	New Haven	Gold
Barnard Environmental Magnet School	New Haven Board of Education	New Haven	Gold
BIC Renovations & Improvements	BIC Consumer Products	Shelton	Certified
C Smart Dealership	inskip automotive group	Fairfield	Certified
CBNA, Downtown Bridgeport		Bridgeport	Certified
Citi GWM - Stamford FSP		Stamford	Certified
Foodshare, Inc. New Distribution Facility	Foodshare	Bloomfield	Certified
GE - Norwalk, CT	GE CPSO	Norwalk	Certified
GE CP SO		Stamford	Gold
GE Real Estate - 3rd, 4th, & 5th Fl	GE	Norwalk	Certified
Greenwich Academy Middle School	Greenwich Academy	Greenwich	Silver
Hotchkiss new residence halls	Hotchkiss School	Lakeville	Gold
Kohls Department Store- Waterbury, CT		Waterbury	Certified
L.L. Bean South Windsor, CT	L.L.Bean, Inc.	South Windsor	Silver
Malone Engineering Center		New Haven	Gold
Monahan building	Hotchkiss School	Lakeville	Gold
Newtown Youth Academy	Bulk Materials International	Newtown	Silver
Pfizer Clinical Research Unit	Pfizer	New Haven	Silver
Pratt & Whitney Building G	Pratt & Whitney	East Hartford	Silver
SCSU New Residence Hall	CT DPW	New Haven	Certified
South Residential Village	Department of Public Works	Willimantic	Certified
Stevens Building	New Canaan Country School	New Canaan	Silver
Stop&Shop, #605		Glastonbury	Certified
Stop&Shop, #614		North Berlin	Certified
Stop&Shop, #621		Southbury	Certified

Project Name	Owner	City	LEED Rating
Stop&Shop, #632		Rocky Hill	Certified
Stop&Shop, #665		E. Lyme	Certified
Stop&Shop, #673		Fairfield	Certified
Stop&Shop, #699		South Windsor	Certified
The Children's School	The Children's School	Stamford	Certified
The Mark Twain House & Museum Center	The Mark Twain House & Museum	Hartford	Certified
UConn - Burton Complex & Shenkman Center	University of Connecticut	Storrs	Silver
USCG Research and Development Center	Corcoran Jennison	New London	Silver
WCSU Residence Hall and Parking Garage	Department of Public Works	Danbury	Certified
Wesleyan University Fauver Field Residence	Wesleyan university	Middletown	Certified
Yale Art & Architecture	Yale University	New Haven	Gold
Yale Sculpture Building	Yale University	New Haven	Platinum
Yale SHM C3 Renovations	Yale University	New Haven	Gold
Yale Stoeckel Hall	Yale Office of Facilities	New Haven	Gold
Yale University Chemistry Research Building	Yale University	New Haven	Silver
Source: LEED Project Directory, U.S. Green Building Council			

Appendix L

Education Required and Salaries for New and Emerging Green Collar Occupations		
Occupation	**Required Education Level**	**Average Salary**
Green Building Equipment Supplier	None	$51,000
Weatherization Installer and Technician	Short-term training	$27,000
Wind Turbine Technician	High School Diploma	$36,000
Solar Installer/Solar Thermal System Technologist	High School Diploma (plus training, certificate)	$31,000
Environmental Science & Protection Technician	Associate's	$42,160
Environmental Engineering Technician	Associate's	$54,876
Building Inspector	Associate's	$51,654
Sustainable Architect	Bachelor's	$97,000
Green Chemist	Bachelor's	$71,000
Fuel Cell Engineer	Bachelor's	$70,000
Environmental Engineer	Bachelor's	$62,000
Biofuel Engineer	Bachelor's	$82,000
Solar Engineer	Bachelor's	$77,000
Hydroelectric Engineer	Bachelor's	$63,000
Wind Turbine Engineer	Bachelor's	$65,000
Energy Efficiency Engineer	Bachelor's	$71,000
Energy Auditor	Associate's or Bachelor's	$65,000
Renewable Energy Consultant	Bachelor's	$33,000
Wind Energy Consultant	Bachelor's	$70,000
Solar Energy Consultant	Bachelor's	$84,000
Carbon Management Specialist	Bachelor's	$55,000
Environmental Policy Analyst	Bachelor's	$64,000
Sustainability Coordinator	Bachelor's	$47,000
Fuel Cell Technician	Bachelor's	$39,000
Environmental Consultant	Bachelor's	$65,843
Hydrologist	Master's	$64,250
Geoscientist	Master's	$82,389

Sources: Connecticut Energy Education, Institute for Sustainable Energy at Eastern Connecticut State University (www.ctenergyeducation.com/greenjobs.htm).
May 2008 State Occupational Employment and Wage Estimates – Connecticut, U.S. Bureau of Labor Statistics (http://www.bls.gov/oes/2008/may/oes_ct.htm#b00-0000).
Connecticut Career Resource Network Update, Spring/Summer 2009.
Connecticut Economic Digest, a joint publication of the Connecticut Department of Labor and the Connecticut Department of Economic and Community Development, December 2008.

Appendix M

Results of the Connecticut Conference of Independent Colleges Survey for the PRI Study of the Alignment of Postsecondary Education and Employment

In July 2009, the Connecticut Conference of Independent Colleges (CCIC) offered to survey its members to provide information relevant to the alignment of postsecondary education and employment.

The following 14 independent colleges and universities completed the survey:

- Albertus Magnus
- Connecticut College
- Fairfield University
- Goodwin College
- Mitchell College
- Rensselaer
- Sacred Heart University
- Saint Joseph College
- Trinity College
- University of Bridgeport
- University of Hartford
- University of New Haven
- Wesleyan University
- Yale University

Questions covered such topics as need for remedial coursework, career advising, process for adding new programs and degrees, and job attainment following graduation. A summary of the responses from the 14 independent colleges is now provided.

Percent of students admitted from private high schools. The percent of students admitted from private high schools ranged from 4 percent (Goodwin College) to 49 percent (Fairfield University), with an average of 28 percent.

Percent of accepted students who are transferring from community colleges. There is a wide range in the percent of accepted students who are transfers from community colleges, ranging from one percent or less (Connecticut College, Fairfield University, Trinity College, Wesleyan University, Yale University) to 40 percent of more (Albertus Magnus, Goodwin College, St. Joseph College, University of Bridgeport).

Remedial coursework. The colleges were asked what percent of their students took at least one remedial course. Of the 10 colleges who responded to this question, six said they did not offer remedial courses, while two of the colleges reported as many as approximately half of their students took at least one remedial course.

The percent of students taking a math remedial course ranged from six percent to 35 percent, and the percent taking an English remedial course ranged from 12 percent to 34 percent.

Campus career advising efforts. A multitude of activities were described by the independent colleges and universities. The following are some of the career advising efforts offered:

- Meet one-on-one or in groups with students to develop/explore career goals
- Use of standardized assessment instruments/career interest inventories to help guide career decisions
- Available career information/career library
- Resume and letter writing assistance
- Job search methods, interviewing skills
- Online access to current employment and internship postings
- Internship, co-op programs
- Pre-professional counseling for potential medical, dental, law students
- Assistance with graduate and professional school applications
- Interviewing techniques
- Career-related seminars and workshops, guest panelists (including alumni)
- Job fairs/on-campus recruitment, and accessing CTDOL College2Career Fairs
- Career advising through academic departments and individual faculty

Collaborations with public colleges and universities. While at least five of the 14 respondents reported no collaboration with any of Connecticut's public colleges or universities, a number of survey respondents mentioned active articulation agreements with local community colleges in the fields of engineering, nursing, criminal justice, social work, business and general degree completion.

Additionally, there is a Hartford Consortium for Higher Education, an independent and public university collaboration, that allows students to cross-register among its public institution members (UConn, CCSU, Capital) and independent institution members (Trinity College, University of Hartford, St. Joseph College, and Hartford Seminary).

Also mentioned was membership in the Connecticut Cooperative Education and Internship Association, a group of career services professionals from both two- and four-year colleges and universities with active experiential learning programs.

Connecticut Department of Higher Education/ Board of Governors. Few suggestions were made regarding ways the Connecticut Department of Higher Education (DHE) could be more effective or helpful to the independent colleges and universities. One respondent suggested that DHE could provide more support and guidance for *developing articulation agreements with local community colleges*, including developing a handbook or other guide about how to develop such agreements.

When specifically asked about the Board of Governors of Higher Education process for approving new programs or degrees, many reported that the process added on three to six months once the application was submitted. It is a two-part process: first licensure (to begin the program) and then accreditation (to award degrees). A degree cannot be awarded unless the program is accredited by the state.

The delay in implementing a new program due to this approval process presents a challenge to colleges operating in an entrepreneurial mode, trying to get new programs marketed and running very quickly in order to meet the needs of the marketplace and community.

Several of the respondents pointed out that the Board of Governors does not meet in July and August, slowing the process down even further. The need to market new programs prior to enrolling students, additionally delays the offering of new programs.

The national colleges (Connecticut College, Trinity College, Wesleyan University, Yale University) are not required to participate in this approval process. Several respondents pointed out that in most states, the state does not approve individual programs, and this precedent should be expanded to include all of the private colleges in Connecticut. One respondent noted that independent institutions should have autonomy in developing new programs, subject to oversight by the regional accrediting agency. The current process impedes the responsiveness of the independent institutions to emerging needs.

Beyond eliminating the requirement for independent colleges to participate in the program and degree approval process, another suggestion was to consider developing 'fast-tracks' for program development in areas of workforce shortage. For example, the Board of Governors could specify that, given a particular workforce shortage, the college proposing a new program to meet that need would have a shorter application the would require the college to show adequate resources (faculty, library, financial), and have developed a curriculum to be licensed to offer a program in the shortage area.

Yet another suggestion was that once a college is accredited (e.g., by the NEAS&C), it may not be necessary for the Board of Governors to approve every new degree program. However, what is necessary is a report to the Board of Governors so that programs conform to their records.

Lastly, concern was expressed that recent retirements had reduced the professional staff supporting program review processes from three to one—anticipating a possible further slow down in the approval process.

New program additions. Responses to how many new programs were typically added in one year, ranged from none to five new programs. One college noted that the last time a new program was added was in the early 1960s. About half responded that the college had added none or one new program. Table M-1 shows the new programs noted at each of the colleges that responded to the CCIC survey—some mentioned programs added within the past three to five years, while others just mentioned programs added in the past year.

Table M-1. Programs Recently Added to the Independent Colleges and Universities	
College/University	**New Programs**
Albertus Magnus	• MS in Education
Connecticut College	• Computer Science (2002) • Film Studies (2002)
Fairfield University	• BS in Biochemistry • MFA in Creative Writing • MA in Communications
Goodwin College	• Associate degree in Environmental Science • Associate Degree in Criminal Justice • Associate Degree in General Studies • Certificate in Brownfield Remediation • Certificate in Riverine Ecology • Certificate in Water Distribute Operations • Certificate in Water Treatment Operations • Certificate in Environmental Health Technician • BS in Child Studies • BS in Health Science • RN-BSN
Mitchell College	• Early Childhood Education • Business • Hospitality and Tourism • Global Studies • Sport Management • Homeland Security • Communications
Rensselaer	None
Sacred Heart University	• MA in Criminal Justice • BS in Marketing (2009) • MS in Exercise Science and Nutrition (2009) • ESL Programs (2009)
St. Joseph College	• Online Masters in Biochemistry • Online Masters In Nutrition • Bachelor's in Women's Studies • Graduate Certificate in Latino Community Practice
Trinity College	• Environmental Science

Table M-1, Continued. Programs Recently Added to the Independent Colleges and Universities	
College/University	**New Programs**
University of Bridgeport	• Online MS in Computer Science • Online MS in Technology Management • MS in Instructional Technology • Ph.D. in Computer Science and Engineering • Certificate in Human Resource Management • Online B.S. in Dental Hygiene • M.S. in Dental Hygiene • Online M.S. in Dental Hygiene • Online B.S. in General Studies • B.A. in Martial Arts Studies • M.A. in Global Development and Peace • B.A. in Criminal Justice and Human Security(pending) • B.S. in Health Sciences (pending) • B.S. in Medical Technology (pending) • M.S. in Physician Assistant (pending)
University of Hartford	• Masters in Aural Habilitation • Masters in Prosthetics and Orthotics • Bachelor's in Secondary Education in Mathematics • Master of Fine Arts in Illustration
Wesleyan University	None
University of New Haven	• M.S. in Network Systems • B.A. in Theatre • M.S. in Labor Relations in Waterbury, CT
Yale University	• Computing and the Arts (2008) • Modern Middle East Studies (2008) • Added BS program to BA program in Psychology • South Asian Studies
Source: July 2009, the Connecticut Conference of Independent Colleges (CCIC) survey	

Discontinued programs. Responses to how many programs are dropped per year often elicited a response of "rarely" or "none." Discontinued programs are shown in Table M-2.

Percent of registered nurses placed within six months of graduation. Survey respondents with nursing programs at their colleges or universities reported anywhere from 65 percent to 100 percent employed within six months of graduation.

Percent of engineers placed within six months of graduation. Survey respondents with engineering programs at their colleges or universities reported a range from 60 percent to 100 percent employed within six months of graduation. One university commented that graduates continued in positions held while an engineering student and others went directly to graduate school.

Table M-2. Programs Recently Discontinued by the Independent Colleges and Universities	
College/University	**Discontinued Programs**
Albertus Magnus	• Rarely
Connecticut College	• Typically none • Masters in Music • Masters in Biology • Masters in Botany • Masters in Chemistry
Fairfield University	• None dropped within the past year
Goodwin College	• Associate in Computer Systems Technology
Mitchell College	• None
Rensselaer	• None
Sacred Heart University	• Certificate in Spirituality • B.S. in Environmental Science • Bachelor's in Information Technology in Luxembourg
St. Joseph College	• Bachelor's in Environmental Science • Bachelor's in Sociology • Bachelor's in Economics
Trinity College	• None
University of Bridgeport	• None since 2000
University of Hartford	• Master's in Counseling • 6th Year Certificate Program in School Administration
Wesleyan University	• None recently • Last discontinued program was the Master of Arts in Teaching (1971)
University of New Haven	• Several Certificate programs (not specified)
Yale University	• Renaissance Studies
Source: July 2009, the Connecticut Conference of Independent Colleges (CCIC) survey	

Percent of graduates who remain in Connecticut to work. The percent of graduates who remain in Connecticut to work was estimated to range from seven percent (Yale University) to ninety percent (Albertus Magnus College). As one would expect, the national universities had lower percentages, while the regional colleges had higher percentages.

Ways Connecticut Department of Labor workforce shortage projections are used. While a few respondents said they did not use the Connecticut Department of Labor workforce shortage projections, many of the independent colleges and universities reported using the information in their planning process and determining which new programs are feasible to consider offering. Others mentioned using the information in preparing their application for new program approval by the Board of Governors.

Some specific examples given included: use of the projections to grow their School of Nursing, including expansion of accelerated second degree program for adult learners to enter the nursing profession; initiation of an articulation agreement between the community colleges

and the School of Engineering; and expansion of special education and bilingual/TESOL education programs.

Some respondents also noted that their career centers used and distributed "Connecticut Career Paths" for student exploration purposes. College career services also provide such information to professionals and academic advisors, and to students and alumni as an aide to planning their academic programs and subsequent careers.

Other comments. The following are some of the additional comments provided by CCIC survey respondents.

"As a private institution, we take great care to align our program development efforts with real student needs. As a liberal arts college, we are also sensitive to the role of a general education in developing thoughtful and competent citizens."

"Although about 75% of our students enter the workforce immediately after graduation, as a liberal arts college, we are not primarily concerned with educating students to commence particular careers immediately upon graduation…"

The university's "…education is about more than employment at the completion of four years. Rather, it is the development of the person, the mind, and the heart. Career development is a part of that process but it is not a means to an end…"

"Studies and trends indicate that career offices need to assume a place at the strategic and academic decision-making levels as colleges adjust to meet 21st century challenges in a complex, global world…"

"Curricula that require internships for college graduation are becoming the norm in most disciplines which are employment specific…"

(would be helpful to have) "…a program to encourage nurses to get graduate degrees so that we might have more nurse educators…"

"In tough times, there has been movement to support and fund workforce retraining—some or much of which has been oriented to two-year colleges…On the other hand, dramatic changes in the global economy require cultivation of high-level skills to confer competitive advantages on University graduates. Thus we encourage greater funding for education at the 4-year and graduate-levels."

"It is our experience that in Connecticut, the task of economic development is especially challenging because the region's strength—its diversity of communities and reputation for municipal autonomy—does not equip it well for planning its future in global economy. We lack a strong regional identity as well as the institutions (e.g., county government or a "Research Triangle" type of brand) that facilitate planning and cooperation among towns and stakeholders…"

Appendix N

Green Certificates and Degrees Offered at each of the Connecticut Community Colleges														
Program	**Credit/ Noncredit**	**Degree Certificate**	**ACC**	**CCC**	**GWCC**	**HCC**	**MCC**	**MXCC**	**NVCC**	**NWCC**	**NCC**	**QVCC**	**TRCC**	**TXCC**
Alternative Fuel Vehicles	credit	certificate			x									
Automotive Technology	credit	degree			x				x					
Automotive Technician	credit	certificate			x									
Architectural Technology	credit	degree		x							x		x	
Construction Technology	credit	degree or cert									x	x	x	
Sustainable Building Efficiency / Facilities Management	credit	certificate									x		x	
BPI Certificate	noncredit	certificate				x			x					
Building Analyst Training	noncredit	certificate									x			
Connecticut Lead Supervisor Initial Training	noncredit	certificate									x			
Envelope Professional Training	noncredit	certificate									x			
Go Green Certificate Program	noncredit	certificate						x						
Green Building Boot Camp	noncredit	certificate		x										
Hazwoper Initial Training	noncredit										x			
Intro. to Green Building	noncredit			x										
LEED Certificate	noncredit	certificate		x										
Sustainable Building / Advisor Certificate	noncredit	certificate			x	x								
Weatherization Training I and II	noncredit	certificate		x		x					x			
Certificate in Sustainable Energy	credit	certificate					x							
CL & P Residential Home Energy Audit	noncredit	certificate							x					
Solar Installer Certificate	noncredit	certificate			x									
Envir - Pre-Environmental Liberal Arts and Sciences	credit	degree				x								
Environmental Engineering Technology	credit	degree											x	
Environmental Science / Toxicology / Biotechnology	credit	degree			x		x	x	x				x	
Landscape and Horticulture	credit	degree							x					
Technology Studies: Environmental Science: Natural Resources Option	credit	degree								x				
Landscape-Sustainable - Ecology & Conservation Technician	credit	certificate											x	
Water - Clean Water / Water Treatment	credit / nc	certificate			x				x					

Hazardous Materials Operational / Waste Site Worker	noncredit	certificate						x						

Appendix N

Green Certificates and Degrees Offered at each of the Connecticut Community Colleges														
Program	**Credit/ Noncredit**	**Degree Certificate**	**ACC**	**CCC**	**GWCC**	**HCC**	**MCC**	**MXCC**	**NVCC**	**NWCC**	**NCC**	**QVCC**	**TRCC**	**TXCC**
Recycling Auditing Certificate	noncredit	certificate							x					
Lean Manufacturing	credit	certificate										x		
Manufacturing Electronics	credit	degree	x											
Manufacturing Engineering Science	credit	degree					x							
Manufacturing Engineering Technology	credit	degree			x								x	
Manufacturing Technology	credit	degree						x						
Manufacturing Technology Certificate	credit	certificate						x						
Technology Studies: Machine Tech Option	credit	degree	x											
Green Welding	noncredit								x					
Alternative Energy Systems Technology	credit	certificate							x					
Alternative Fuel Cell Technology	credit	degree							x					
Biotechnology	credit	degree						x						
COT: Technology Studies	credit	degree	x	x	x	x	x	x	x	x	x	x	x	x
Electrical Engineering Technology	credit	degree			x				x					
Electronics Technician	credit	certificate			x									
Source: Assistant Chancellor of Connecticut Community College System														

Appendix O

Credit and Noncredit "Green" Courses Available at Connecticut Community Colleges

Term	Credit Course Title	ACC	CCC	GWCC	HCC	MCC	MXCC	NVCC	NWCC	NCC	QVCC	TRCC	TXCC	TOTALS
Fall 2007	Environmental Regulations	-	-	15	-	-	-	-	-	-	-	-	-	15
Fall 2007	Environmental Studies	-	-	-	-	-	-	-	-	-	-	31	-	31
Fall 2007	Environmental Systems	-	12	-	-	-	-	-	-	26	-	-	-	38
Fall 2007	GREENHOUSE MANAGEMENT II	-	-	-	-	-	-	8	-	-	-	-	-	8
Fall 2007	General Ecology with Lab	-	-	-	-	-	-	-	26	-	-	-	-	26
Fall 2007	Intro to Environmental Sci	-	-	-	-	82	46	-	54	-	-	-	-	182
Fall 2007	Intro to Environmental Science	-	-	-	-	-	-	-	-	-	30	-	-	30
Fall 2007	LAB, Water Resources Engr	-	-	-	-	-	-	-	-	-	-	8	-	8
Fall 2007	Principles of Ecology	11	-	-	-	-	-	-	-	-	-	-	-	11
Fall 2007	Water Resources Engineering	-	-	-	-	-	-	-	-	-	-	8	-	8
Spring 2008	ENVIRONMENTAL SCIENCE	-	-	-	-	-	-	24	-	-	-	-	-	24
Spring 2008	Environmental Issues Seminar	-	-	-	-	-	-	-	-	-	-	16	-	16
Spring 2008	Environmental Systems	-	-	-	-	-	-	-	-	22	-	-	-	22
Spring 2008	GREENHOUSE MANAGEMENT I	-	-	-	-	-	-	19	-	-	-	-	-	19
Spring 2008	Intro to Environmental Science	-	-	-	-	138	43	-	47	-	39	-	-	267
Spring 2008	Principles of Ecology	31	-	-	-	-	-	-	-	-	-	-	-	31
Spring 2008	ST: Environmental Science	-	-	-	-	-	-	-	-	-	-	-	12	12
Summer 08	General Ecology with Lab	-	-	-	-	-	-	-	12	-	-	-	-	12
Summer 08	Intro to Environmental Science	-	-	-	-	-	-	-	17	-	-	-	-	17
Fall 2008	Environmental Regulations	-	-	12	-	-	-	-	-	-	-	-	-	12
Fall 2008	Environmental Studies	-	-	-	-	-	-	-	-	-	-	55	-	55
Fall 2008	Environmental Systems	-	11	-	-	-	-	-	-	24	-	-	-	35
Fall 2008	GREENHOUSE MANAGEMENT II	-	-	-	-	-	-	11	-	-	-	-	-	11
Fall 2008	General Ecology with Lab	-	-	-	-	-	-	-	20	-	-	-	-	20
Fall 2008	Intro to Environmental Science	-	-	-	-	137	51	-	62	-	28	-	-	278
Fall 2008	LAB, Water Resources Engr	-	-	-	-	-	-	-	-	-	-	13	-	13
Fall 2008	Principles of Ecology	24	-	-	-	-	-	-	-	-	-	-	-	24
Fall 2008	Sustainable Energy & the Env	-	-	-	-	28	-	-	-	-	-	-	-	28

Fall 2008	Water Resources Engineering	-	-	-	-	-	-	-	-	-	-	13	-	13

Appendix O

Credit and Noncredit "Green" Courses Available at Connecticut Community Colleges

Term	Credit Course Title	ACC	CCC	GWCC	HCC	MCC	MXCC	NVCC	NWCC	NCC	QVCC	TRCC	TXCC	TOTALS
Spring 2009	ENVIRONMENTAL REGULATIONS	-	-	-	-	-	-	24	-	-	-	-	-	24
Spring 2009	ENVIRONMENTAL SCIENCE	-	-	-	-	-	-	25	-	-	-	-	-	25
Spring 2009	Environmental Issues Seminar	-	-	-	-	-	-	-	-	-	-	21	-	21
Spring 2009	Environmental Law	-	-	-	-	23	-	-	-	-	-	-	-	23
Spring 2009	Environmental Systems	-	-	-	-	-	-	-	-	26	-	-	-	26
Spring 2009	GREENHOUSE MANAGEMENT I	-	-	-	-	-	-	20	-	-	-	-	-	20
Spring 2009	Intro to Environmental Science	-	-	-	-	137	50	-	59	-	48	-	-	294
Spring 2009	Introd. to Environ. Science	-	-	27	-	-	-	-	-	-	-	-	-	27
Spring 2009	Principles of Ecology	8	-	-	-	-	-	-	-	-	-	-	-	8
Spring 2009	Sustainable Energy & the Env	-	-	-	-	27	-	-	-	-	-	-	-	27
Summer 09	General Ecology with lab	-	-	-	-	-	-	-	10	-	-	-	-	10
Summer 09	Intro to Environmental Science	-	-	-	-	-	-	-	13	-	-	-	-	13
Fall 2009	Environmental Regulations	-	-	22	-	-	-	-	-	-	-	-	-	22
Fall 2009	Environmental Studies	-	-	-	-	-	-	-	-	-	-	74	-	74
Fall 2009	Environmental Systems	-	12	-	-	-	-	-	-	24	-	-	-	36
Fall 2009	GREENHOUSE MANAGEMENT II	-	-	-	-	-	-	11	-	-	-	-	-	11
Fall 2009	General Ecology with Lab	-	-	-	-	-	-	-	21	-	-	-	-	21
Fall 2009	Intro to Environmental Science	-	-	-	-	195	68	-	65	-	71	-	-	399
Fall 2009	Introd. to Environ. Science	-	-	48	-	-	-	-	-	-	-	-	-	48
Fall 2009	LAB, Water Resources Engr	-	-	-	-	-	-	-	-	-	-	14	-	14
Fall 2009	Principles of Ecology	17	-	-	-	-	-	-	-	-	-	-	-	17
Fall 2009	Sustainable Energy & the Env	-	-	-	-	27	-	-	-	-	-	-	-	27
Fall 2009	Water Resources Engineering	-	-	-	-	-	-	-	-	-	-	16	-	16
	TOTALS:	**91**	**35**	**124**	**-**	**794**	**258**	**142**	**406**	**122**	**216**	**269**	**12**	**2,469**

Appendix O

Credit and Noncredit "Green" Courses Available at Connecticut Community Colleges

Term	Credit Course Title	ACC	CCC	GWCC	HCC	MCC	MXCC	NVCC	NWCC	NCC	QVCC	TRCC	TXCC	TOTALS
Summer 2007	GREEN BLDG HOME IMPROVEMENT	-	-	-	-	-	-	5	-	-	-	-	-	5
Fall 2007	R/E ENVIRONMENTAL ISSUES	-	-	-	-	-	-	-	-	36	-	-	-	36
Fall 2007	GREEN REVOLUTION OVERVIEW	-	-	-	-	-	-	9	-	-	-	-	-	9
Fall 2007	Environmental Interests (LiR)	-	-	-	-	-	-	-	-	-	47	-	-	47
Spring 2008	Greenhouse Basics	-	-	-	-	-	-	-	6	-	-	-	-	6
Spring 2008	R/E ENVIRONMENTAL ISSUES	-	-	-	-	-	-	-	-	47	-	-	-	47
Spring 2008	Solar App. For Your Home/Bus.	-	-	6	-	-	-	-	-	-	-	-	-	6
Spring 2008	Solar/Thermal Energy-Intro	-	-	28	-	-	-	-	-	-	-	-	-	28
Spring 2008	Environmental Seminar	-	-	-	-	-	-	-	-	-	-	10	-	10
Fall 2008	Trash/Going Green	-	-	-	-	-	38	-	-	-	-	-	-	38
Fall 2008	Solar App Your Home/Business	-	-	15	-	-	-	-	-	-	-	-	-	15
Fall 2008	Solar/Thermal Energy-Intro	-	-	16	-	-	-	-	-	-	-	-	-	16
Fall 2008	Sustainable Bdg Advisor Cert	-	-	19	-	-	-	-	-	-	-	-	-	19
Spring 2009	Greenhouse Basics	-	-	-	-	-	-	-	6	-	-	-	-	6
Spring 2009	Solar Application for Home/Bus	-	-	7	-	-	-	-	-	-	-	-	-	7
Spring 2009	Sustainable Business Develop	-	-	7	-	-	-	-	-	-	-	-	-	7
Spring 2009	Will Solar Electric & Thermal	-	-	7	-	-	-	-	-	-	-	-	-	7
	TOTALS:	**-**	**-**	**105**	**-**	**-**	**38**	**14**	**12**	**83**	**47**	**10**	**-**	**309**

Source: Assistant Chancellor of Connecticut Community Colleges

APPENDIX P

STATE OF CONNECTICUT

OFFICE FOR WORKFORCE COMPETITIVENESS

October 5, 2009

The Honorable John A. Kissel
Co-Chair, Legislative Program Review and
Investigations Committee
State Capitol, Room 506
Hartford, CT 06106

The Honorable Mary M. Mushinsky
Co-Chair, Legislative Program Review and
Investigations Committee
State Capitol, Room 506
Hartford, CT 06106

Dear Senator Kissel and Representative Mushinsky :

I am writing in response to two reports that will be the topic of the Legislative Program Review and Investigations Committee's public hearing scheduled for October 6, 2009. While OWC will not be providing formal testimony at that time, we wish to acknowledge and applaud the exceptional work of the Program Review Committee's staff for their comprehensive overview of two critically important, interrelated and often misunderstood policy topics; topics that this office has long believed to be essential to the sustainability of Connecticut's quality of life.

We view the two reports, ***Postsecondary Education and Employment*** and ***Connecticut's Economic Competitiveness in Selected Areas*** as complimentary and reinforcing volumes that bring focus to the critical and complex challenges affecting Connecticut's competitive position in the 21st century global marketplace. Taken together, we found the reports to be insightful, comprehensive, and certainly consistent with the views, ideas and recommendations that have come out of this office for almost a decade. We can add little more to the discussion beyond what our reports and proposals have already laid out.

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Our assessment of Connecticut's competitive challenges over the next twenty years has been consistent for the past nine years. Simply stated:

On the one hand:

- Because of geography and regional markets, the cost of production in CT is higher than most other states and that will always be the case;
- Connecticut's competitive edge has always been in its value-added productivity – making more, faster, better and at less cost;
- Higher productivity is created through invention and innovation (Yankee Ingenuity) – from the cotton gin to the assembly line to the transistor to the microchip, the application of technology provides the competitive edge that compensates for high costs of production and transforms a labor-based economy into a tech-based economy;
- Tech-based economies must stay in the race when it comes to technological advancements and innovation; state-of-the-art research and development is fundamental with academic institutions and in industry working in partnership to stay ahead of the pack;
- Tech-based economies are fueled by the growth and interplay of small companies that are agile and responsive to a fast-moving tech-driven marketplace and adapt the new innovations and inventions into commercial products and new enterprises; they are the real producers of jobs that pay a wage equal to the cost of living;
- Greater advancement and adaption of technology requires the availability of talent with increasingly higher skills and competencies – which means stronger STEM and reading achievement levels in our <u>future</u> workers; our students;
- Tech-based economies must be supported by public policy and incentives that create an environment that nurtures creativity, innovation and risk-taking; growing 21st century talent applies equally to government policymakers and business leaders who are aware of the integral and fragile connections between generating 21st century talent and supporting a competitive economy in a global marketplace.

On the other hand:

- Because of geography and regional markets, the cost of consumption in CT is higher than most other states and that will always be the case;
- Connecticut's population growth has been negligible over the past decade;
- Connecticut is one of the oldest states in the nation with respect to median age of its population;
- Connecticut has more households without school-age children than households <u>with</u> school-age children;

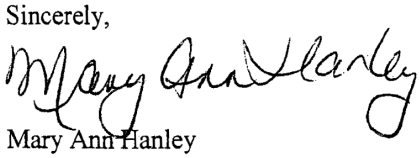
- In order to afford a home and raise a family in CT, some post-secondary education and training is a must in order to secure the necessary income;
- The largest proportion of our future workforce entrants over the next 20 years will be coming out of our urban centers;
- Connecticut's educational achievement gap is the widest in the nation, student mastery of science and math is well below international standards and non-credit remedial programs put a serious drain on our talent pipeline after high school;
- Connecticut is still a net exporter of college students (often our best and brightest) and graduation rates are disturbing at best, especially in our urban centers – where our future workforce lives;
- Broad based public policy supporting a tech-based economy has been haphazard and inconsistent and never at the level of commitment required to spark scalable innovation in any given area of promise (stem cell research comes the closest but it is confined to only two Connecticut institutions – moreover, the research funding in the stem cell area took the wind out of any commitment to new efforts like nanotechnology – which is the future of manufacturing; which was and still could be the backbone of Connecticut's economy);
- Government structure (executive and legislative) is based on a 1950s model -- built vertically, in discreet silos (departments and committees). This model impedes the ability to identify and aggregate programmatic assets laterally -- across agencies -- or to engage in any integrative approach to making investments. Growing skilled talent and building an environment supportive of innovation, twin necessities for competing in a 21st century marketplace, are not independent issues. Yet multiple departments and independent legislative committees are organized around pieces of the issue. (The initial decision of the Program Review Committee to authorize two separate reports on issues that are in fact two sides of the same mountain, illustrates this – that fact that staff appeared to have worked together in developing the reports is exemplary);
- The structure and schedule of the education system is worse – the "school year" continues to revolve around the 18th century cycles of planting and harvesting and the daily operation resembles the 19th century industrial model -- moving product (students) from station to station (even using a bell like on the shop floors of old).

These findings and observations are all supported by data and have been documented and submitted to the legislature and Governor; the full list of publications and reports is included as an appendix to the **Postsecondary Education and Employment** report. It is important to note that in the course of raising these issues and concerns, we have also consistently cautioned that there is no one to blame for where we now find ourselves. These issues are a function of demographic, economic and technological changes that are moving the entire globe into another age; the information age. We are literally all in this together. We are, however, all to blame if, knowing the challenges, we fail to adjust. Not just adapt; but to adjust.

I have to tell you that there is a heavy sense of irony when looking at our office's capacity today juxtaposed to the findings in the two reports you are about to consider. But the affirmation of our work reflected in the findings was at the same time reassuring. We are hopeful that the complex and inter-related issues around growing 21st century talent and stimulating a tech-based economy will get the serious and sustained attention and consideration that is required. These are not matters for discussion at one meeting, one hearing, one legislative session or even one biennial budget cycle. The solutions are not off-the-shelf; they require study and analysis that lead to transformative policies and informed investments. Most importantly, they require the political will to stay with the mission over the long haul. Those states that adjust will succeed; those who simply adapt will be risking nothing less than the quality of life of their citizens.

As always, we stand ready to help move this important agenda forward with you in any way you see helpful.

Sincerely,



Mary Ann Hanley
Office for Workforce Competitiveness

STATE OF CONNECTICUT

EMPLOYMENT AND TRAINING COMMISSION

WALLACE BARNES
CHAIRMAN

October 5, 2009

The Honorable John A. Kissel
The Honorable Mary M. Mushinsky
Co-Chair, Legislative Program Review and
Investigations Committee
State Capitol, Room 506
Hartford, CT 06106

Dear Senator Kissel and Representative Mushinsky:

On behalf of the Connecticut Employment and Training Commission (CETC), I write to express my appreciation for the Legislative Program Review and Investigations Committee's report on "Alignment of Postsecondary Education and Employment." Your staff clearly put in a great deal of time and effort in collecting and organizing a variety of detailed and complex information. Even more impressively, the report reflects a commendable degree of understanding of the complicated issues behind the data, and a grasp of the difficulty involved in any attempts to coordinate the fragmented and diffuse "non-system" that exists at present in Connecticut, with its differing loci of functional responsibilities regarding linkages between higher education and jobs. Figure V-1, illustrating the complexity of the public system for workforce development, was particularly telling.

One of the most gratifying aspects of the report, from our point of view, was the inclusion of much of the information that has been produced by the Office for Workforce Competitiveness (OWC) under the auspices of CETC. The report addressed key issues such as the workforce needs of the 21st century and the demographic challenges faced by the state, as well as increasingly disturbing shortages of skilled workers in critical career fields. In particular, we were pleased to see the mention of CETC's 2009 Annual Report, including the "talent pipeline" concept that has been fundamental to our efforts for the past few years. We think that the information developed under the aegis of CETC can be helpful to policy-makers as they consider ways to address these difficult issues, and so we are pleased to see that the report reflects an appreciation of the implications of that information.

I assure you that the members of CETC will follow your efforts on these matters with interest, and that staff from the Office for Workforce Competitiveness would be happy to testify or provide input in other ways that you may think helpful as you develop specific recommendations for action.

Sincerely,

Wallace Barnes
Chairman

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