

'Retooling' Recession Displaced Workers for Green Collar Jobs

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More than 8 million U.S. jobs were lost during 'The Great Recession', pushing unemployment from 4.4% in 2007 to 10.2% in 2009. Nearly half of all job losses occurred among lower-skilled workers in construction and manufacturing industries. During this same period, however, jobs in energy efficiency and renewable energy industries grew an unprecedented 9%. As part of a $4.8M grant from the U.S. Department of Labor, the University of Nebraska has begun development of a workforce transition program to 'retool' recession displaced workers for career opportunities in new and emerging green industries. To date, the knowledge, skills, and abilities (KSAs) of recession displaced 'blue collar' workers have been assessed in relation to the skill sets required of 'green collar' workers in building-related industries as determined by a survey of more than 6,000 businesses. Using this data, a two-tier curriculum was then developed to 1) address common pre-vocational skills training needed for the unskilled and *un*employed, and 2) vocational skills training for the semi-skilled and *under*employed with the goal of creating sustained reemployment for 1,000 Midwest workers.

Key Words: Curricula Development, Sustainable Building

Introduction

A recession is generally defined as a decline in gross domestic product (GDP) for two consecutive quarters, or, an increase in unemployment of 1.5% or more within 12 months or less. In the modern era of economic statistics (e.g. 1945 to present), there have been 11 recessions averaging 10 months in duration. Typically, construction and manufacturing activity recovers quickly following a recession. Given the duration and severity of the most recent recession, however, there exists a large inventory of vacant and foreclosed building stock, an unprecedented loss of income, property values and equity, and, an increasingly restrictive credit market. As a result, construction is not anticipated to recover for several years and job losses in many manufacturing sectors may be permanent. For these reasons, it is highly unlikely that sufficient new job growth will occur in these industries to meet the needs of recession displaced workers within the foreseeable future. Consequently, new industries must be cultivated to create alternative reemployment opportunities.

As part of the $787B American Recovery and Reinvestment Act of 2009 (ARRA), nearly $43B in 'stimulus' funds were earmarked to promote investment and job growth in energy efficiency and renewable energy industries. Following a global movement toward a 'greener' economy, alternative energy markets are viewed as catalysts for sustainable job growth as well as environmental protection, energy independence and national security. However, preliminary results of a 2011 Midwest survey indicate that women, young males and those lacking high school education are least likely to transition from recession displaced industries to green occupations (Thompson et al., 2011). One possible hypothesis for this phenomenon is that members of these demographic groups may lack the adult basic education (ABE) or transferable knowledge, skills and abilities (KSAs) necessary to compete for jobs in new and emerging green industries. As a result, the fundamental question underlying this research is whether or not green jobs can provide reemployment opportunities for recession displaced workers, and if so, what gaps exist between the KSAs of these displaced 'blue collar' workers in relation to those required of 'green collar' workers.

To answer this research question, a 'pilot' program called *syNErgy* was developed with the goal of transitioning 650 *un*employed workers and 350 *under*employed workers from recession impacted occupations to high growth 'green' jobs by 2013. For the purposes of this research, a green job was defined as:

> *...one in which an employee produces a product or provides a service that improves energy efficiency, expands the use of renewable energy, or, supports environmental sustainability.*

To achieve this goal, a survey of more than 6,000 Midwest businesses was first conducted in 2010 to assess the gaps between 1) the existing skills sets of recession displaced workers in construction and manufacturing industries, and, 2) the new skills sets required of workers in green building-related industries (e.g. energy auditors, HVAC and weatherization technicians, solar and 'small' wind power installers, etc.). Next, a two-tiered curriculum was developed to provide 1) prevocational training to unskilled workers, and 2) vocational training to semi-skilled workers as a pathway for either entry-level reemployment, or, higher-level training and higher wage-earning reemployment (Figure 1).

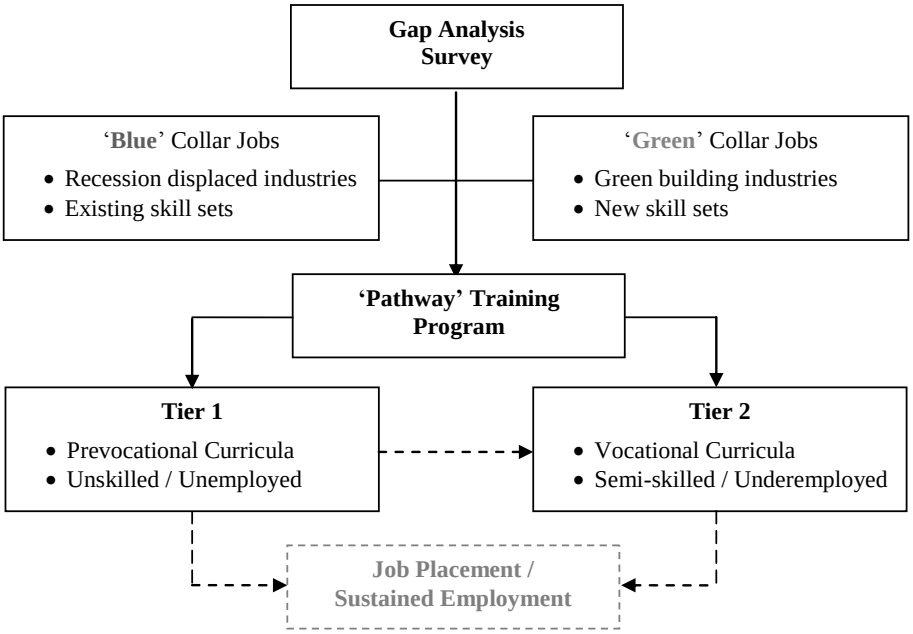

Figure 1: Two-tier pathway training program.

Methodology

KSA Gap Analysis Survey

As part of a six-state Midwest survey, nearly 12,000 Nebraska businesses were mailed questionnaires to determine trends in the growth of green jobs, and, to identify unique green collar KSAs requiring training. Employers within the state were categorized by type of business activity using the North American Industry Classification System (NAICS). Of nearly 1,200 'six digit' NAICS industry categories, 127 industries representing 11,917 businesses were identified as producing a product or service that improves energy efficiency, expands the use of renewable energy, or, supports environmental sustainability. A second survey was sent to businesses which had not responded within one month of the first survey mailing. Finally, a phone survey was conducted with businesses that had not responded to either mail survey. The overall response rate after the two mailings and phone survey was 52.8% (n = 6,292). Survey findings (see 'Results') revealed two (2) distinct occupational groups of green collar jobs available for recession displaced workers; 1) those that required vocational training and certification, and, 2) those that did not require training and certification, but, required a 'pre-vocational' level of ABE and employability (e.g. 'soft') skills.

Tier 1 – Prevocational Curriculum

For those green collar occupations that did not require vocational training, but did require ABE, an 80-hour prevocational curriculum was developed to provide basic skills deficient adults, having at least an 8th grade literacy level, exposure to the verbal and non-verbal (e.g. written) communication skills, mathematics and reading comprehension skills necessary to obtain entry-level employment. In addition, the prevocational curriculum was developed to provide basic labor skills training, including the use of general (e.g. non-trade specific) hand and power tools, job safety and work readiness skills. To provide added value, content was developed to qualify participants for industry recognized certifications and provide an orientation into green building-related trades.

Unlike traditional classroom instruction, however, ABE instruction was integrated or 'contextualized' within the framework of practical skills training. Contextualized learning has proven particularly effective for ABE deficient adult learners who value short, hands-on instructional segments where they can relate new skills to their real-world experiences. Given the challenges of providing extended training to a largely unskilled audience, many with language and socioeconomic barriers to employment, the 80-hour curricula was designed to be delivered in both English and Spanish during a continuous 8-hour per day, two-week 'boot-camp'.

Tier 2 – Vocational Curriculum

For those green collar occupations that required vocational training, a 40-hr vocational curriculum was developed to provide ABE competent adults a nationally-recognized green building certification. The curriculum was required to provide meaningful training to semi-skilled workers from a variety of trades, and, provide certification recognized by high-growth green building industries identified by the survey (see 'Results'). In addition, the vocational curriculum was developed to provide the prerequisite competencies necessary for more advanced green building training and specialization (e.g. solar and 'small' wind power, weatherization, HVAC, lighting, etc.). The vocational curriculum was designed to be adaptable to several delivery formats including a one-week seminar, or, a 3-contact hour course within a building-related apprenticeship, diploma or degree program.

Both Tier 1 (prevocational) and Tier 2 (vocational) curricula were developed in 2010-11 to be deployed by each of six (6) Nebraska community colleges and three (3) in-state trade labor organizations specializing in work readiness certificate programs by 2013. Subsequently, the focus of this 'work in progress' was dedicated to the KSA gap analysis survey, and, the Tier 1and Tier 2 curricula completed at the time of this publication.

Results

KSA Gap Analysis Survey

Data extrapolated from 6,292 survey respondents found that approximately 30,725 green jobs, roughly 3.4% of Nebraska's workforce, produce a product or service that improves energy efficiency, expands the use of renewable energy, or supports environmental sustainability. Of 26.6% of Nebraska businesses reporting green economic activity, 36.1% identified themselves under the category of energy efficiency and conservation (Figure 2). Nearly one third (29.1%) of businesses in the construction industry classified themselves within the energy efficiency and conservation category.

The construction industry had the highest number of businesses reporting at least one green job with 266 of 1,039 businesses (25.6%) indicating they employed at least one green employee. With 6,595 green employees, an estimated 15.1% of the construction workforce dedicated some portion of their time to performing sustainable building practices in 2010. Mechanical trades were found to have the highest number of workers (1,656) and highest percentage of workforce (87.2%) dedicating some portion of their time to energy efficiency or other sustainable building related activities. Overall, roughly two-thirds of all green workers (63.9%) dedicated 50% or more of their time to green work.

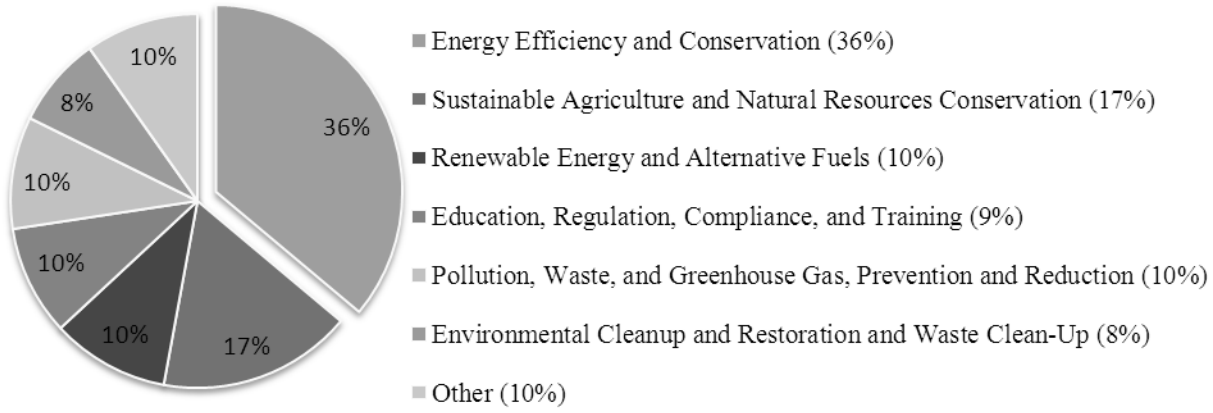

Figure 2: Nebraska businesses by 'green' economic activity.

In addition to having the highest number of workers and highest percentage of workforce engaged in green building-related activities, mechanical trades are anticipated to achieve the highest growth rate in green jobs (37.9%) by 2018 (Figure 3) followed by electricians (15.7%). More than 70% of new jobs in the mechanical trades are projected to be 'growth' openings, compared to roughly 30% replacement (e.g. attrition) openings. In contrast, less than 40% of new jobs in electrical trades are expected to be generated by growth in green economic activities.

Businesses were also asked what types of barriers exist in preventing implementation or expansion of green economic activities, including the creation of green jobs. Barriers most commonly cited by respondents included cost of implementation (20.4%), economic conditions (18.5%) and government policies and regulations (9.7%). However, nearly one-third of respondents cited either a lack of information or expertise (19.4%), a shortage of workers with applicable knowledge or skills (6.9%), or, a shortage of available training programs (4.2%) as barriers to implementing or expanding green economic activity.

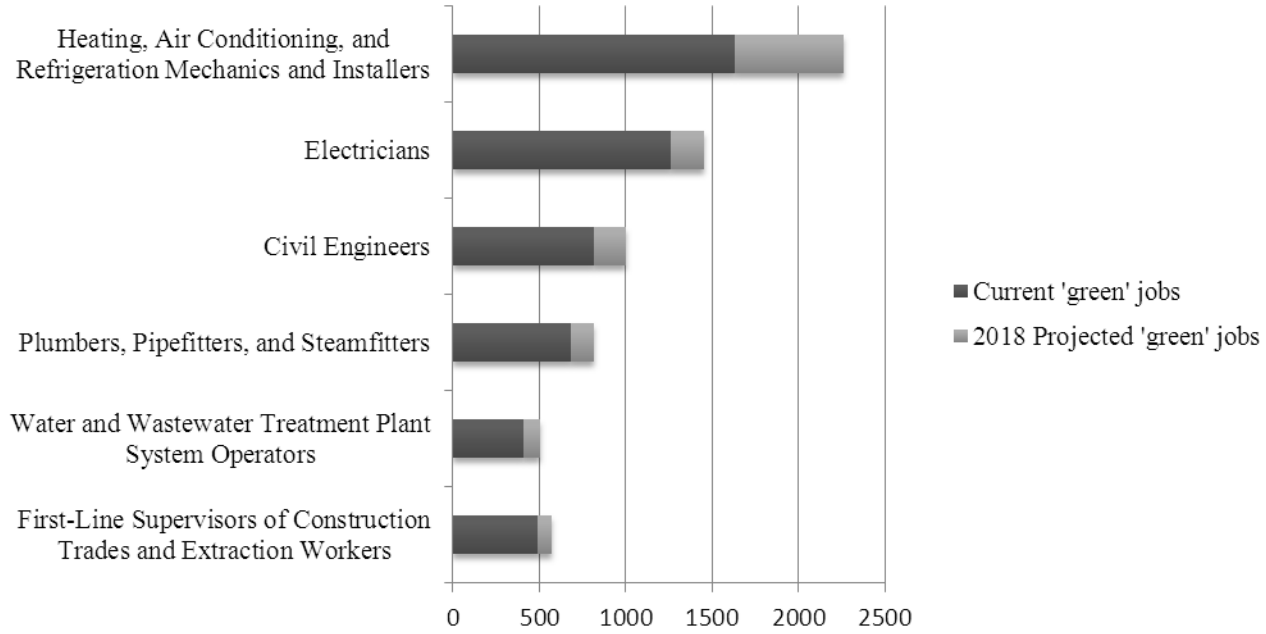

Figure 3. Current and projected 'green' jobs by trade or occupation.

Employers were also asked what they considered to be the minimum KSAs required to perform green jobs. When asked to indicate the top-ranked skill deemed by the employer to be the most important, 36.8% indicated that employability or 'soft' skills were most important, followed closely by vocational or job-specific skills (35.5%) and pre-vocational basic skills (15.8%). Employability skills were defined as social skills, teamwork, attitude, reliability, work ethic and appearance. Vocational skills were defined as documented knowledge and experience such nationally or industry recognized licensure, certification and credentialing.

Of green jobs associated with construction, 80.7% require a minimum of a high school diploma or at least a 9th grade equivalent. However, among occupations expected to experience the highest growth in green jobs through 2018 (e.g. mechanical and electrical trades), most will require vocational or trade certification in addition to secondary education. Workforce demographic data indicates that *under*employed workers, or workers that have work experience or informal (e.g. 'on-the-job') training beyond the requirements (and compensation) of their current job, are generally 'semi-skilled' in nature and often lack documented or transferable vocational skills certification. Worse, *un*employed workers, or workers without jobs but actively seeking employment, are generally 'unskilled' and often lack the prevocational skills necessary to qualify for vocational training, or, to obtain even entry level employment.

As a result, the KSA gap analysis clearly indicates the need to develop a two-tiered curriculum to address 1) pre-vocational skills training needed for the unskilled and unemployed, and 2) vocational skills training for the semi-skilled and underemployed with an emphasis on building energy efficiency and conservation.

Tier 1 – Prevocational Curriculum

An 80-hour prevocational training curricula was developed to provide basic skills deficient adults exposure to the ABE skills and basic labor skills required for either vocational training (e.g. Tier 2), or, entry-level employment. After consultation with ABE experts, 80 continuous contact hours was considered the optimal trade-off in time necessary to teach ABE deficient adults basic prevocational and work readiness skills in relation to the time such persons would realistically remain committed to the program. The two-week curriculum was organized into six (6) modules (below) identified by industry respondents as required for entry-level employment, or, qualification for vocational training (e.g. trade apprenticeships, skills certifications, etc.).

- Module 1 – Safety
  - Basic PPE and first aid
  - Electrical and fall hazards
  - Struck-by and caught-in hazards
  - Drugs and alcohol
- Module 2 – Mathematics
  - Measurement (IP and SI units)
  - Ratios, fractions and percentages
  - Statistics, charts and graphs
  - Geometry
  - Estimating
- Module 3 – Tools and Equipment
  - Hand tools
  - Power tools
- Module 4 – Communications Skills
  - Reading and writing
  - Speaking and body language
  - Processes and technologies
- Module 5 – Employability Skills
  - Job search
  - Resume and cover letter
  - Application and interview
  - Employer expectations
  - Teamwork
  - Becoming a leader
- Module 6 – Green Building Industry
  - Your role in green industry
  - Introduction to the trades

Each module was organized into several 1-2 hour instructional subunits, each with a list of core ABE learning objectives, labor skills demonstration objectives, material and equipment requirements (including personal protective equipment or 'PPE'), exercises and projects (both individual and group). Daily training 'blocks' were created by integrating a complimentary mix of ABE skills subunits (e.g. math, reading and communication skills)

and 'hands-on' basic labor skills subunits (e.g. safety, tools, employability skills, etc.) within both classroom and lab environments.

For example, one exercise on the second day of training involves proper selection and placement of ladders (Figure 4). Specifically, students are first required to understand the significance of fall hazards on the jobsite, identify the basic types of ladders and their use, and, be able to read and comprehend the manufacturer's safety instructions (e.g. side rail labeling). Next, students are presented with several scenarios in which they must select the proper ladder according to the required working height and load capacity. Students are asked to review U.S. Occupational Safety and Health Administration (OSHA) excerpts on ladders (CFR1926 Subpart X) and identify main points that apply to each scenario, such as proper placement and use. In scenarios involving extension ladders for example, students are required to calculate the proper placement angle (e.g. setback distance), determine the extension length required above the landing surface, and, visually identify nearby hazards (e.g. electrical). The exercise reinforces basic ABE concepts in *module 2-mathematics* (e.g. geometry and ratios) within the context of basic labor skills training in both *module 1-safety* (e.g. fall hazards) and *module 3-tools and equipment* (e.g. hand tools-ladders).

Figure 4: Sample contextualized learning approach.
(Ex. "If the landing surface is 12' above grade, what is a) the OSHA prescribed base distance from the wall, and b) the total extension length of the ladder given 3' extension above the landing surface?)

Although the organization of modules (and subunits) did not necessarily dictate the order of training, early instruction was intended to focus on the safety and basic mathematic competencies necessary for the safe and effective use of tools and equipment used in later progressions. A focus on safety during the first three days of training would also help to ensure that 'dropouts' could at least obtain an industry recognized certification, the OSHA 10-hour safety card, even if they did not complete the two-week course. Related, students were required to complete all safety instruction and demonstrate proficiency in non-energized hand tools before progressing to power tools training. Elements of *module 4-communications skills* and *module 5-employability skills* were integrated throughout the training to allow the instructor a certain level of flexibility to apply (or supplement) training material to their particular audience. Finally, *module 6-green building industry*, was developed to provide students an orientation into the concept of resource efficient design and construction and the various trades involved in green building.

Tier-2 Vocational Training

A 40-hour vocational training curricula was developed to provide ABE competent adults a nationally-recognized green building certification. Specifically, the *Building Analyst I* curriculum was developed to provide an entry-level credential in the fundamentals of building energy science. For the purposes of the *syNErgy* program, this 40-hour vocational curriculum was intended for semi-skilled, underemployed workers lacking transferable credentials recognized by new and emerging green building industries. As a pre-requisite for more advanced training in building energy efficiency and renewable energy technologies, this vocational curriculum provides participants the KSAs necessary to perform residential energy audits according to the standards set forth by the Building Performance Institute (BPI) as recognized by the U.S. Department of Energy (DOE).

Adaptable to either a one-week workshop, or, a 3-contact hour per week semester/quarter course, the 40-hour curricula was organized into fourteen (14) modules (below) to assess home energy performance, health and safety as well as provide the foundation for more specialized training in commercial energy auditing (e.g. *Building Analyst II*), agricultural energy auditing and 'small' wind power generation.

- Module 1 – Introduction
- Module 2 – Principles of Energy
- Module 3 – Basics of Heat
- Module 4 – Basics of Moisture
- Module 5 – Basics of Airflow
- Module 6 – Building Structural Elements
- Module 7 – Insulation
- Module 8 – Building Mechanical Systems
- Module 9 – Blower Door & Pressure Diagnostics
- Module 10 – Combustion Testing
- Module 11 – Common Problems & Solutions
- Module 12 – Energy Audit Process
- Module 13 – Health and Safety
- Module 14 – Business of Energy Auditing

Figure 5. Combustion zone and blower door

Each of the above 1-hour classroom modules begins with a content overview and concludes with sample problems, questions and exercises. Classroom instruction is followed by approximately 16 hours of field training which includes conducting an actual home energy audit. Beginning at the exterior of the building, the prospective auditor is taught to identify potential hazards, structural concerns, and areas where moisture can infiltrate the building through vapor or bulk. The condition of windows, doors, roofs, and other aspects of the envelope are analyzed. The audit continues throughout the interior of the home, again identifying areas of concern where moisture and energy loss/gain can potentially occur. The mechanical system is audited for efficiency. A combustible appliance zone (CAZ) test is performed on each appliance which uses combustible fuel (Figure 5). A monometer and other instruments are used to teach the students how to perform spillage, draft and carbon monoxide (CO) tests in a CAZ. A blower door test is also performed as part of the audit. The blower door test depressurizes the residence and allows the auditor to use the monometer to determine pressure changes throughout the home. Knowing where the pressure differentials exist in a building helps the auditor understand and identify potential areas of concern where infiltration may exist. The audit is completed by providing a home owner with the written results of the tests and diagnostic solutions to make the residence more energy efficient.

In addition to classroom and field training, the *Building Analyst I* certification requires both a written and field examination. The 2-hour online written exam consists of 100 questions with a passing score of 70%. The 2-hour field exam requires the student to perform and actual home energy audit. During the field exam, the instructor grades the student's performance. The audit is video-taped and further reviewed by BPI staff prior to certification

Discussion

To determine whether or not green jobs can provide reemployment opportunities for recession displaced workers, a 'pilot' program was developed to transition 1,000 *un*employed and *under*employed workers from recession impacted occupations to high growth green jobs by 2013. As part of this program, more than 6,000 businesses were surveyed to assess the gaps between 1) the existing KSAs of recession displaced workers in relation to 2) the new skills sets required of workers in green building industries. A two-tiered curriculum was then developed to provide 1) prevocational training to unskilled workers, and 2) vocational training to semi-skilled workers as a pathway for either entry-level reemployment, or, higher-level training and reemployment.

To date, both Tier-1 (prevocational) and Tier-2 (vocational) curricula have been completed. 'Train-the-Trainer' (TtT) sessions have been conducted with instructors from six (6) Nebraska community colleges and three (3) in-state trade labor organizations specializing in work readiness certificate programs. A total of 431 Nebraska participants have enrolled in training, including 177 (41.1%) unemployed and 254 (58.9%) underemployed participants. Of these, 256 (59.4%) have completed training with 214 (83.6%) completions resulting in a recognized credential. Of the unemployed participants entering training, 44 (24.9%) have entered reemployment, including 38 (86.4%) that have entered training-related employment.

As part of the 3-year *syNErgy* program, additional 'short-course' curricula and certification programs are being developed in more specialized areas of building energy efficiency and renewable energy such as 'small' wind generation, commercial energy auditing (e.g. *Building Analyst II*), agricultural energy auditing, and on-site biofuels (Figure 6). These specialized areas of training and certification are intended to provide the knowledge, skills and abilities required of new and emerging green industries. As a result, it is anticipated that the training program will be self-sustaining beyond the grant, providing participants long-term and sustainable employment opportunities.

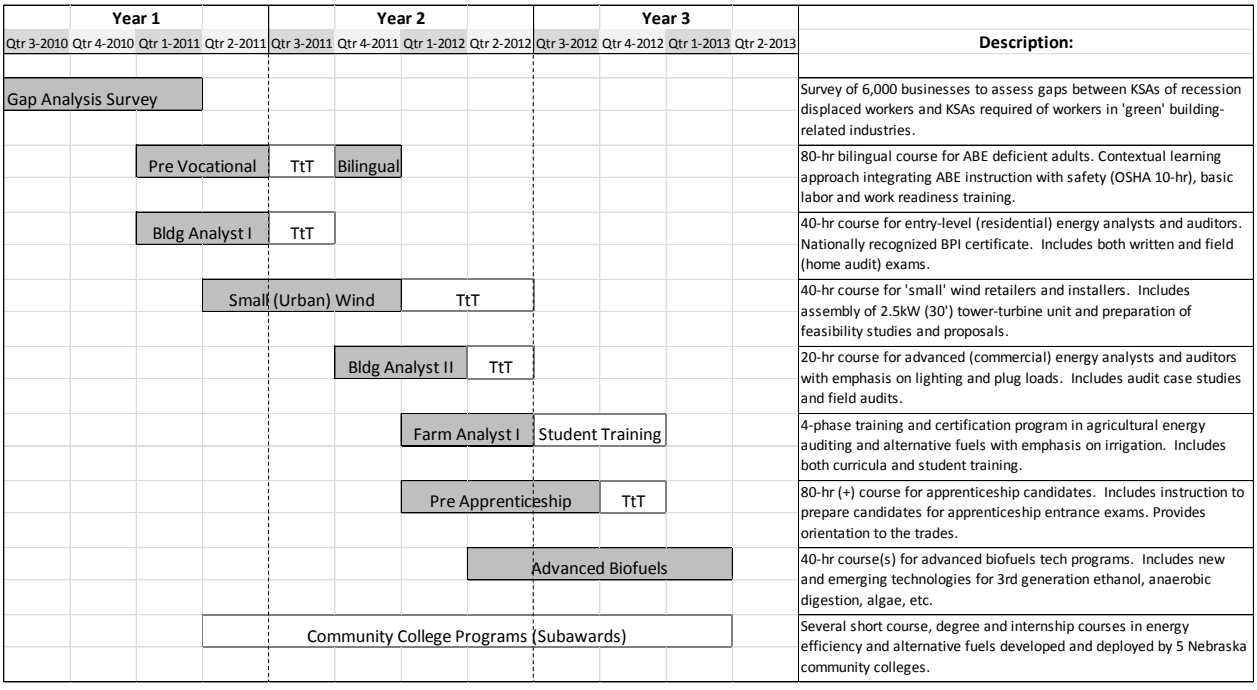

Figure 6. syNErgy program plan, 2010-13.

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