

Exploring Green in Real-Time

A New Hampshire Perspective



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Exploring Green in Real-Time: Project Highlights

The Green in Real-time Project was designed to gather information on green occupations and industries by extracting information from descriptions of jobs posted online. This approach did not yield expected results. Research activities were then shifted to a two-pronged approach. Data extracted from online job postings were looked at separately from an examination of the green economy. This provided a substantial amount of information about both real-time demand data and New Hampshire's green economy.

Key Findings: Real-time Demand Data

- **Job Ad vs. Job Openings.** A job ad does not equate to a job opening nor does it equal a hire.
- **Not a universal data set.** Online job posting data does not represent the universe of job demand; the data is biased toward industries and occupations that typically post online.
- **Data limitations.** Online postings are advertisements and are not created for data analysis.
- **Real-time demand is context sensitive.** Words within the text of a job ad are context sensitive. Words can be misinterpreted by parsing software.
- **Granular data can be deceptive.** Time frames, geography, and occupational level need to be kept large enough too smooth out spikes and reduce data misclassification.
- **Data should not stand alone.** Online data should be used in conjunction with other labor market information or measures to create a more complete picture for overall job demand.
- **Online postings still require substantial review.** Though extracted and parsed using an electronic process, review by a person with labor market knowledge is still needed for reliable results.
- **New data source.** Real-time demand data has the potential to supply new information about job titles and the required skills, certifications, and educational qualifications necessary for in-demand jobs.

Key Findings: Green Jobs in New Hampshire

- **Green skills permeate most occupations and industries.** Unlike skills specific to a type of work, such as health care or information technology, it is possible to apply a green skill in nearly any occupation or industry.
- **Green has various meanings and characteristics in each industry.** There is no overarching green stamp. Green certifications can apply to a worker, a company, or a company's product and/or service.
- **Green is an additional layer of skills.** Green skills are extra skills on top of the basic and industry skills required for a job, such as supplemental green training, certification, or accreditation.
- **Jobs are not 100 percent green or not green.** Very few jobs in New Hampshire are 100 percent green. At the same time, many jobs and workplaces are becoming greener by incorporating green practices, processes or products.
- **The term “green job” does not always mean new job creation.** While some green jobs are new occupations, more often existing jobs become “greener” by increased occupational requirements relating to energy efficiency or sustainability.
- **Job advertising methods.** The preferred strategy of job advertising for many green firms is word of mouth.

Exploring Green in Real-Time for New Hampshire

Introduction

In 2009, the US Department of Labor’s Employment and Training Administration issued a grant for State Labor Market Information Improvement. The purpose of grant funds was to “collect, analyze, and disseminate labor market information, and to enhance the labor exchange infrastructure for careers within the energy efficiency and renewable energy industries.”¹ New Hampshire Employment Security’s Economic and Labor Market Information Bureau (ELMI) partnered with Maine, Vermont, Massachusetts, Connecticut, Rhode Island, New York, and New Jersey in forming a consortium to apply for grant funding. The eight states in the Northeast Consortium were joined by the Center on Education and the Workforce at Georgetown University, Burning Glass Technologies, and Direct Employers Association. Among the goals outlined in the grant were defining green jobs and industries, identifying green skills, recognizing new trends or requirements in the workforce, analyzing current and future demand for workers through online job posting data, and creating labor market information tools.²

One of the goals for the Northeast Consortium was to establish an alternative measurement for green jobs by identifying green jobs through green skills in online job posting data. Concurrently, each of the Northeast Consortium states defined “green” for their state independently of one another, with each individual state adopting a broad or narrow definition of green. All states had similar themes among their definitions, including energy efficiency and renewable energy.

Defining Green — the NH Definition and How It Was Developed

In developing a definition of green for New Hampshire, ELMI began with the Employment and Training Administration’s (ETA) framework for green jobs. The ETA’s framework was broad, identifying areas of the economy that could potentially include green economic activities. However, ETA’s framework did not include a specific definition of what constitutes a green business nor did it include a definition of a green job. The Bureau of Labor Statistics (BLS) also developed a definition, defining green industries using two different approaches, the first based on business output and the second based on production method. The output approach identified green businesses by the product or service provided, while the process

¹. Federal Register, Vol. 74, No. 120, Wednesday, June 24, 2009. Notices. pp. 30128

². Northeast Consortium Grant Proposal. Technical Proposal Northeast Research Consortium. Part II. Page 1.

approach identified green businesses by the production processes used.³ Yet neither of these approaches included those businesses using energy efficient, renewable energy, or sustainability practices as part of the business model — thus not capturing many of New Hampshire’s honored green businesses.

Looking at state reports on green research provided a perspective on what other states were considering green. Green definitions were categorized into two main types. One was a narrow definition, recognizing only employment in renewable energy and energy efficiency as green; and the other a broader definition, including principles such as pollution prevention, environmental remediation and clean-up, promotion and advocacy, and green practices.

ELMI determined that a broader definition of the green economy was most appropriate for New Hampshire. For the purpose of research into the green economy in New Hampshire, businesses are considered green if they offer a green product or service, use a green process, or engage in a green practice.

Green Products and Services: Businesses whose end products support renewable energy, energy efficiency, and environmental sustainability; but might not use a green production process. Examples: wind turbine manufacturers, energy efficient light bulb retailers, energy efficiency consultant.

Green Process: Businesses utilizing environmental management, a significantly environmentally safe or energy efficient method, regardless of whether or not the actual end product is green. Examples: lean manufacturing processes, LEED building architects and contractors, or ISO 14001 certification.

Green Practice: Businesses engaged in environmentally sustainable activities and environmental stewardship but that otherwise do not produce a green product or utilize a green process. Examples: a restaurant that uses recycled cooking oil to heat their building, a business using solar or wind for electric power.

³. At present, BLS is conducting a survey of businesses in order to identify establishments that use environmentally friendly production processes (www.bls.gov/green/#overview).

The “Cutting Edge” of LMI Research: Real-Time Demand

Tracking an emerging sector is a difficult task for researchers as the qualities and attributes are not yet known or established. New Hampshire, as part of its role within the Northeast Consortium, began researching green jobs using O*Net, the Occupational Information Network. O*Net researchers identified green occupations using three measures: occupations that will have an increase in demand because of the green economy; occupations that will gain enhanced skills as a result of the green economy; and new and emerging occupations created because of the green economy.⁴ The drawback of this method of measuring green jobs is that O*Net codes label an entire occupation as green, and thus are likely to cause an over-count of employment. But O*Net coding can serve as a guide to those occupations with the potential for requiring green skills. The Consortium hoped to identify individual green jobs by first identifying specific green skills in job postings, then measuring demand for related occupations.

The “Look Under the Hood”

Recently, the use of real-time demand data, also known as online job ads or postings, has become more frequently reported. Real-time demand data is being used by some labor market information (LMI) staff and workforce investment boards as a measure of demand, and a guide for training development or public policy. Thus, it is critical for researchers, policy makers, and other data users to have an understanding of what real-time labor demand data is, how it is obtained, and the information it can — and cannot — provide.

The Northeast Consortium had the unique opportunity to “look under the hood” of real-time demand data by examining the content of online job ads in detail. In addition to looking at green and non-green skills, the Consortium expected to review key data variables such as occupation, industry, educational requirements, certifications, salary, and benefits offered. Given the real-time labor demand products already available, the Consortium had high expectations of its usefulness. However, after taking the “look under the hood,” the Consortium became resigned to the fact that there are more data limitations than previously thought, and the validity of some data variables is highly questionable. In hindsight, this makes sense, since job postings are not written for data analysis. Research has helped define specific limitations of the data, providing data users a better understanding of what real-time data can and cannot do, and the potential for continued analysis of this data.

4. Rivkin, David and Lewis, Phil, et.al. National Center for O*NET Development. Feb 2009. “Greening of the World of Work: Implications for O*NET-SOC and New and Emerging Occupations.” <www.onetcenter.org/reports/Green.html>.

Real-Time Demand

What is Real-Time Data?

Currently most available labor market information is based on data gathered through required forms, reports, surveys, and similar sources. Data are compiled, modeled, screened for confidentiality, estimated, and measured for error. The process of gathering and analyzing data creates a lag time for publication of “traditional” LMI that is unavoidable. But how to measure what is happening at the present time, instead of the past? The goal of examining online job postings was to gain a real-time measure of worker demand.

Collecting and cataloging real-time data occurs through “spidering” the Internet for job postings, extracting the related text, and parsing the text into standardized data categories. Virtual “spiders” are programmed to search websites for job postings, and then compile those search results into one database. The results are referred to as real-time data, as it provides information in “real-time”—it gathers job postings when employers are posting them. The data is then “parsed” to separate the text into different variables. From one job posting, the employer name, job title, salary, education requirements, certifications and skills, among other variables, are identified. Each parsed variable can be aggregated for statistical data analysis. The availability of parsed variables is the most significant value-added attribute of real-time data. It allows for useful analysis of data, and provides ease of analysis for researchers.

There are several things to know about the overall data collection process that can affect data analysis.

- **Time frames.** The spidering frequency can create artificial data spikes. If spiders compile data on a bi-weekly basis, there will be a spike in the data set every two weeks. Therefore, using data time frames that are too short will not reflect job demand, but instead reflect data collection methods.
- **Duplication.** When a job ad is posted, it frequently appears on more than one website, creating the potential for spiders to capture duplicate data, i.e., the same posting taken from multiple web sites. Methodologies to identify and remove duplicated postings are known as a de-duplication process. In the Consortium’s research, it was found that removing all duplicated postings is not possible, but the de-duplication process is able to reduce a significant amount of redundant data.⁵

⁵: Based on Data Quality Review, Burning Glass Parser 3.0.1

- **Consistency.** Spidering new websites can be very useful for job seekers, but are problematic for time series analysis. In order to compare variables over time, spiders must access a consistent set of websites. Currently, this goal has not been achieved. On the other hand, frequently spidering new websites provides information about changing demand and has potential for identification of new and emerging occupations.

The Nature of Postings

When evaluating real-time demand data there are two main factors to keep in mind. The first factor is the universal nature of online job postings, meaning that regardless of how or when the data was extracted from the web, there will always be certain limitations and biases inherent to online data. Secondly, there are vendor-specific issues to consider that relate to varying technologies and methodologies used by vendors in collecting and cataloging online data. Vendor-specific issues are related to each vendor's spidering, de-duplication, and parsing processes, as well as keywords used in searches and data standardization.

Universal Limitations to Real-Time Online Data

Online job postings are not representative of the universe of overall job demand because job ads posted online are prevalent in some occupational areas and non-existent in others. Online postings are usually vague in geographic location details, and frequently do not include information for analysis such as salary, educational requirements, experience requirements, and required skills. It is especially important to note that a job posting does not necessarily equal a job opening. There are many reasons why a posting should not be considered a vacancy or job opening — there could be duplicate postings for the same job, the employer may not hire after placing an ad, there might be data captured incorrectly as a job ad, or postings could be for full time, part time, temporary, or one-time only work. Therefore, terminology like “total jobs” and “job count” may be misleading. The preferable term for quantifying online job postings is Job Ad Volume. The following list highlights some of the limitations of real-time demand data.

- **Advertising Behaviors:** An analysis of postings based on job family (two-digit SOC level) showed common patterns of advertising behavior. Large employers and corporations were more likely to post all jobs online. Smaller businesses were more likely to only post executive positions online. Also, occupations within certain job families are more likely to be posted online than others, such as jobs in *Computer and mathematics* and *Healthcare practitioners*. In contrast, *Construction and extraction* and *Farming, fishing and forestry* jobs are much less frequently posted online; instead these employers may use newspaper ads or advertise openings by word of mouth.
- **Employers:** The nature of online postings shows that not all businesses post online and that some businesses wish to remain anonymous. Also, employer data are not available on all job boards. If companies are listed, vendors of real-time data must construct ways to standardize

employer data. For example, UPS might be listed as UPS, United Parcel Service, or United Parcel Service of America, Inc. Having multiple names for one company can make data aggregation difficult.

- **Upscale bias of job postings:** Jobs posted online require postsecondary education at a higher rate than what is seen in the overall employed population. A random sample of just over 3,000 postings that included an educational requirement taken in May 2011 showed 71 percent required a Bachelor's degree or higher. This is in contrast to data from the 2009 American Community Survey showing 34 percent of the U.S. employed population between 25 and 64 years of age having attained a Bachelor's or higher.⁶

Because of this dynamic, occupations with higher educational requirements tend to be better represented online while occupations, and sometimes whole industries, that commonly have lower educational requirements are represented to a lesser degree. Real-time demand only looks at online job postings, so results will undercount any occupation or industry that uses other recruitment methods.

- **Certifications are seldom included:** In a sample of 17,761 postings covering third quarter 2011, eight percent contained a certification requirement. Due to the small percentage of overall postings listing a certification, reports discussing certifications can misrepresent their prevalence. However, when a certification requirement was present, it was easily identified and usually parsed (standardized) correctly.
- **Industry and Occupational Identification:** Currently, it is extremely difficult to track data by standard industry or occupational codes. Job postings rarely contain industry specification and are even less likely to include an industry code. Postings often lack necessary variables such as employer information that might be used to identify an industry. Determining an occupation for a job ad was possible, particularly for occupations with a high volume of postings, but many job ads lack the essential information necessary for accurate occupational coding.
- **Location:** Exact job locations are difficult to pinpoint as recruitment can take place regionally, such as referencing the largest city near the work location like "the Boston area." The general location is a proxy at best. Due to parsing accuracy, the location-related variables (e.g., city, county, zip code) should be used with caution. Also, cities or towns with limited broadband internet access may be more inclined to post jobs in newspapers or utilize other methods to advertise jobs. Small geographic areas may have too few online postings to allow reliable analysis.

6. 2009 American Community Survey, table B23006. Educational Attainment by Employment Status for the Population 25 to 64 years.

- **Qualifications and Skills:** Some basic prerequisites, such as passing the bar exam for an attorney, are considered industry or occupational standards. This is presumably the reason why standard requirements are rarely listed in a job posting. It is assumed that qualified applicants know the basic requirements for a job, making it unnecessary to list all qualifications in an online posting. Similarly, the full skill set required for a job is typically not included in a job posting. Another issue discovered when analyzing skills data extracted from the postings was that phrases can have more than one meaning, such as “PT” which can mean Physical Therapist or Part-time, and the word “type,” which can mean keyboard typing or the type of job being posted.
- **Education/Degree Requirements:** Online job postings tend to have higher educational requirements than seen in the broader workforce. Education requirements are more likely to be listed in job postings for which education is a specific requirement of the employer. They generally do not appear in postings that have no educational requirement (postings usually do not say “high school diploma not necessary”), nor in postings for those positions commonly requiring licensure, as it is assumed qualified applicants already know the requirements. New Hampshire performed a quality control check on job postings that did not include an educational requirement and found postings were much more likely to be for positions requiring a higher level of education (attorneys, nurses) than for those with lower-level educational requirements (secretaries, restaurant workers). Also, the lack of a specific educational requirement in a job posting for an occupation not commonly associated with a level of education does not mean there is no requirement at all for the posted position.
- **Salary:** In most online job postings, specific salary information is not included. When salary information is listed, it can be presented in many different forms e.g., annual, monthly, weekly, hourly or more vaguely, including “To Be Determined” and “Based on Experience.” At this time, there is insufficient salary data included in postings for accurate analysis.

Why Analysis of Postings is Difficult for New Hampshire

As a small state, analysis of postings in New Hampshire had added challenges not observed in larger states. The smaller volume of postings for New Hampshire is the main cause of added difficulty, as parser and standardization inaccuracies are more evident in a smaller population.

About three-quarters of job families, however, had a relative level of accuracy in online job postings. Those job families include:

| | |
|---------|-----------------------------------|
| 11-0000 | Management |
| 13-0000 | Business and Financial Operations |
| 15-0000 | Computer and Math |
| 17-0000 | Architecture and Engineering |

| | |
|---------|---|
| 21-0000 | Community and Social Services |
| 23-0000 | Legal |
| 25-0000 | Education, Training, and Library |
| 29-0000 | Healthcare Practitioners and Technical |
| 31-0000 | Healthcare Support |
| 33-0000 | Protective Services |
| 35-0000 | Food Preparation and Serving Related |
| 37-0000 | Building and Grounds Cleaning and Maintenance |
| 39-0000 | Personal Care and Service |
| 41-0000 | Sales and Related |
| 43-0000 | Office and Administrative Support |
| 51-0000 | Production |

Currently, job families with less accuracy are:

| | |
|---------|--|
| 19-0000 | Life, Physical, and Social Sciences |
| 27-0000 | Arts, Design, Entertainment, Sports, and Media |
| 45-0000 | Farming, Fishing, and Forestry |
| 47-0000 | Construction and Extraction |
| 49-0000 | Installation, Maintenance, and Repair |
| 53-0000 | Transportation and Material Moving |
| 55-0000 | Military Specific |

Some job families may be well represented online due to the nature of the occupations within those job families. For example, it is very likely that a posting for a computer programmer will appear online. Job families with high volumes of postings were generally parsed more accurately as the parser “learns” with each job posting it is exposed to. Additionally, many of these job families have high educational or other entry requirements, a factor found to be more prevalent in online postings.

Among the job families that were found to have low rates of representation in online job postings were *Farming, fishing and forestry* occupations; *Construction and extraction*, and *Military specific* occupations. Job advertising methods in these job families seldom include online job postings, and are instead posted on a sign in the door of a business, by word of mouth, or in newspaper classifieds. Analysis of *Farming, fishing and forestry* and *Military specific* occupational families was particularly difficult. The small volume of postings, coupled with parser inaccuracies, made any analysis questionable at best.

Even job families with high relative volume of postings (as a share of all postings) do not represent all job postings or openings in New Hampshire. Comparing total job ad volume in New Hampshire with Local Employment Dynamics New Hire data, published by the Census Bureau, shows significantly higher job openings and new hires than would be expected by looking at real-time data job postings.⁷ Research in this area is new, however, it does indicate that online job postings are only one part of the overall recruitment process.

An unanticipated issue with real-time data analysis was the tendency of some job boards to list the location of every job posting in a state's capital city, rather than the location specified by the actual job posting. Job boards such as these allow a job seeker to search only one location — in New Hampshire's case, Concord. All postings are listed by the job board as being in Concord even if the posting text specifies a different location. A data quality control analysis showed an extremely high error rate (posting attributed to the wrong location) for specific cities, as well as an undercount for the city in which the job posting was truly located. Because this error occurs on the original website for the posting, there is very little that can be done to correct it through the spidering or parsing process, further reinforcing the advisability of using a state level or larger geographic area for data analysis.

Finding Green Jobs by Green Skills

Using existing coding systems to identify green occupations should be avoided because all workers in the occupation are included when counting green workers. Yet very few occupations are entirely green. Instead, each occupation contains a share of workers whose jobs are green and require green skills. To avoid over-counting green jobs, New Hampshire worked with the Northeast Consortium and data vendor Burning Glass Technologies to develop a list of green skills to identify green jobs. The identification of green skills in a job posting provides an independent gauge for measuring green jobs without being restricted to the confines of existing coding systems. It was thought that this process would provide a more accurate measure of green jobs, and could give insight into the types of jobs that are, or are becoming, green. In total, there were nearly 900 green skills identified. Through the parsing process, a green skill appearing in a job posting attached a green “flag” to that job posting. This flag allowed easy sorting and analysis of green jobs.

Upon development of the green skills list, all skill words included were thought to be completely green. Practical use, however, showed that select words had multiple meanings and context was important. Identification of words with multiple meanings had to be restricted to those meeting specific green criteria. For example, “reuse” was listed as a green skill, as it presumably indicated recycling, waste reduction, or similar activities. It was thought that if this word appeared in the text of a job posting, that job posting would be related to green. Quality control analysis showed the word “reuse” was also used in job postings for computer-related

⁷. http://lehd.did.census.gov/led/datatools/doc/QWI_101_no_graphics_20110107.pdf
It should be noted that this comparison looks at total online job ads and total new hires

occupations in the context of “software code reuse.” To correctly identify the term “reuse” as a green skill word, any occupation within the *Computer and mathematics* job family was prevented from triggering a green flag.

Other issues brought to light during quality control analysis included the spidering and parsing of strings of words on a job posting web page containing page navigation, metadata, indexes, unrelated advertisements, and other miscellaneous information. These chunks of text, unrelated to job postings yet sometimes processed as part of job postings, were dubbed “junk headers.” Junk headers were more common on some website than others, and frequently caused false triggers for green flags. For example, the green term “biofuels” was present in one such header, resulting in a nearly 100 percent error rate for all job postings flagged as green from that website. While upgrades to data parsing technology were able to correct for context issues like “reuse,” corrections to spiders and the parser to avoid extracting junk headers were less successful.

The use of green skills in identifying green jobs holds promise. In practice, perhaps due to the novelty of the research method, the Consortium encountered several challenges, reducing the overall effectiveness of using skills to identify green jobs. Currently, an analyst is needed to vet any data prior to publication.

Identifying Green Companies

A second approach to identifying green jobs was to develop a list of green firms for each state, then match that list to postings to see what type of occupations, skills, etc., were being advertised by green companies. For New Hampshire, green firms were identified through publicly available information, primarily use of the internet, industry publications, newspapers and tracking “green” events. Theoretically, the list of green firms would be used to “tag” job postings for those firms as green. Then, by looking at the postings of companies identified as green, analysts could learn about posting behavior, including where these companies post, the types of jobs for which they advertised, how frequently they posted, if they are looking for specific green skills, and if they were posting jobs described as green. The idea was to identify postings with green skills and verify if the company posting the ad was green. An analyst would then use that knowledge to identify other postings with similar requirements and look at those postings to determine if that company was also green and add it to the green firm list. By iterative expansion of the green firms list and the green skills list, the Consortium expected to gather a substantial amount of information about the green economy.

While there were strong hopes for the potential of a green firms list and the knowledge that could be gained from this approach, coding and firm name matching issues prevented the exploration of this theory. As of December 30, 2011, the green firms tag had not produced any valuable information in identification of green firms or green postings.

Process of Quality Control Analysis

Quality control checks were conducted on the Burning Glass extraction and parsing tool to measure the quality and integrity of the data. Quality control analysis was organized by occupational job family to determine normal distribution and characteristics of the occupational group. Additionally, and of equal importance, quality control checks were conducted to identify persistent errors the possible source of those errors, whether spidering, parsing, or other standardization, and to recommend changes in the process to improve accuracy.

Quality Control Results by Selected Job Family

| Job Family | January through June | | | | July through December | | | |
|--------------------------|----------------------|--------------------------------|--|--|-----------------------|--------------------------------|--|--|
| | Number of Postings | Error Rate at Job Family Level | Top Posting Employer within Job Family | Top Posted Job Title within Job Family | Number of Postings | Error Rate at Job Family Level | Top Posting Employer within Job Family | Top Posted Job Title within Job Family |
| Healthcare Practitioners | 6,868 | 5.4% | Dartmouth-Hitchcock | Nurse | 7,133 | 6.3% | Dartmouth-Hitchcock | Nurse |
| Sales and related | 3,570 | 5.0% | Multiple | Sales Associate | 2,549 | 13.0% | Multiple | Sales Associate |
| Production | 1,332 | 18.0% | Staffing agencies | CNC | 1,308 | 12.0% | Staffing agencies | CNC |
| Computer and Math | n/a | n/a | n/a | n/a | 5,556 | 4.6% | Liberty Mutual | Java Developer |

Source: Burning Glass data

The above chart highlights occupational job families most frequently found in online job postings: *Healthcare practitioners and technical occupations*; *Production*; *Sales and related*; and *Computer and mathematics*. With the exception of *Computer and mathematics*, the job families were reviewed in data sets from two time periods: January to June 2010 and July to December 2010. This allowed analysts to determine if any spidering or parsing issues appearing from January to June (2.0 version) were corrected in the July to December (3.0.1 version) data and prevented the inadvertent masking of trends that could occur when the volume of postings is increased. Analysts looked for trends in employers, job titles, locations, education, major, certifications, common skills and common errors.

How Does this Information Benefit NH Job Seekers and Employers?

Real-time data has the potential to provide valuable information to job seekers. Information useful to those seeking work include employers most commonly posting online, most frequently posted job titles and corresponding occupational titles, number of online postings in a given geographic area, and common education, certification and skill requirements. The following reports illustrate the benefit of real-time data to job seekers in two ways. The first report shows total online job posting demand for the third quarter of 2011. It illustrates the total number of job postings during the time period, allowing job seekers to gain an understanding of how many job postings were found online. The report also breaks down postings into job families, and shows both top job titles and top occupational titles, which has the potential to help job seekers use the right vocabulary when searching for postings online and contacting employers.

The second report addresses green job postings exclusively. In addition to highlighting the same variables as described above, job seekers can compare the volume of green jobs posted online to the volume of all jobs posted online, identify the job families having the most green jobs posted, and the specific green skills being sought for the green jobs.

Where the Research Could Go From Here

The Northeast Consortium laid out several areas of research to be conducted under the Labor Market Information Improvement grant. Research areas included; developing a clear definition of a “green job,” developing tools to code green jobs, provide real-time data analysis, and tracking skill and knowledge requirements listed in job postings. Though originally intended as a research tool for the green economy, the data sets have potential as a research tool for several other areas of the economy.

Using the same technique developed to identify terms related to green jobs, Burning Glass Technologies has already begun developing a keyword search for healthcare and information technology occupations. One preliminary finding of technology keywords is the percentage of job postings requiring technology/computer skills that fall outside of the *Computer and Mathematics* job family. The awareness of technology skills being required in a variety of occupations could be useful to job seekers in ensuring they have the skills that are in demand.

The following variables — though limited in consistency — are already available within parsed data sets, and have potential in further analysis of job postings data.

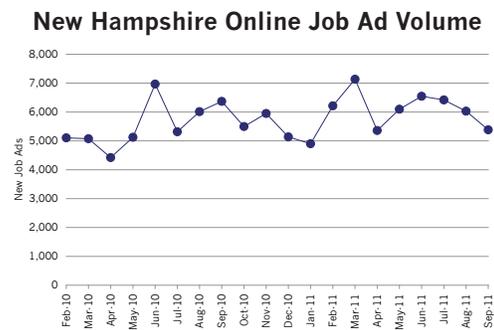
Experience: Some job postings list the amount of experience required for a position. Research showed this variable was parsed fairly well and further research may help to determine the supply and demand ratio between the level of experience in the existing labor force and the corresponding demand.

Online Job Ad Volume New Hampshire Q3 2011

Monthly Ad Trends

There were 17,828 posting for Quarter three of 2011; an increase of only 132 online job ads of job ads from the same quarter in 2010.

The line chart below shows the monthly volume of online job postings for each month starting in February 2010 through September 2011. Over time, there is a slight upward trend in online job ad volume over the 20 month period.*



| Top Job Title | Job Ad Volume |
|---------------------------------|---------------|
| Registered Nurse | 369 |
| Physical Therapist | 226 |
| Teller | 214 |
| Software Engineer | 174 |
| Sales Representative | 162 |
| Occupational Therapist | 161 |
| Sales Associate | 140 |
| Customer Service Representative | 131 |
| Drivers | 123 |
| Administrative Assistant | 121 |

Top Job Titles are a count of job postings with an exact match to the job title seen in the chart. All Registered Nurses counted in this chart are those postings which used only the phrase "Registered Nurse".

Top Posted Occupations takes into account small variations in postings and groups job postings into their corresponding occupation. In this chart, the occupation Registered Nurses includes postings with the phrase "Registered Nurse" as well as variations, such as RN, Staff RN, Operating Room RN and Oncology RN, among others.

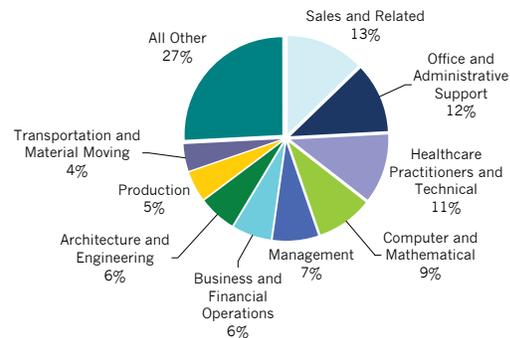
Used in conjunction with one another, job seekers can see how occupations are being phrased in actual job postings, as well as which occupations are currently experiencing a high volume of job postings.

* This could be attributable to an actual increase in posting volume by employers, or could be attributable to the number of web sites scraped.

Postings by Job Family

The pie chart below shows all New Hampshire unduplicated online job ad volume organized by job families for July 2011 through September 2011. The top nine job families are shown with the sum of all remaining job families counted in *All other* job families.

New Hampshire Postings by Job Family



| Top Posted Occupations | Job Ad Volume |
|---|---------------|
| Sales Representatives, Wholesale & Manufacturing | 699 |
| Retail Salespersons | 652 |
| Registered Nurses | 583 |
| Mechanical Engineers | 566 |
| Computer Software Engineers, Applications | 314 |
| Customer Service Representatives | 302 |
| General and Operations Managers | 302 |
| Computer Programmers | 284 |
| Truck Drivers, Heavy and Tractor-Trailer | 283 |
| First-Line Supervisors/Managers of Retail Sales Workers | 281 |

Online Job Ad Volume New Hampshire Q3 2011

Top Online Job Ad Employers

The table below lists the top online employers in New Hampshire. These employers had the largest number of unduplicated online job ads during the third quarter of 2011

| Top Employers | Job Ad Volume |
|------------------------------------|---------------|
| Liberty Mutual | 319 |
| Dartmouth College | 284 |
| Dell | 259 |
| Dartmouth-Hitchcock Medical Center | 191 |
| HCA Capital Division | 160 |
| Lowe's Companies, Inc * | 152 |
| Fidelity | 144 |
| C&S Wholesale Grocers, Inc | 126 |
| Citizens Financial Group | 122 |
| Omni Hotels & Resorts | 114 |
| TD Bank | 111 |
| Dell Perot Systems | 102 |
| Genesis Healthcare Corporation | 99 |
| Pizza Hut | 88 |
| Petco | 72 |
| BAE Systems | 69 |
| Technical Needs | 68 |
| Crossmark | 66 |
| Calm Water Business Partner | 60 |
| JP Morgan Chase Company | 60 |
| Brookstone Incorporated | 59 |
| Secureworks Incorporated | 58 |
| Walmart/Sam's | 58 |
| Bank of America | 57 |
| Staples | 53 |
| Catholic Medical Center | 52 |
| Sears, Roebuck & Company | 50 |

* Lowe's job postings were verified. Job ads were prior to Lowe's announcing the closing of three New Hampshire-based stores.

Education

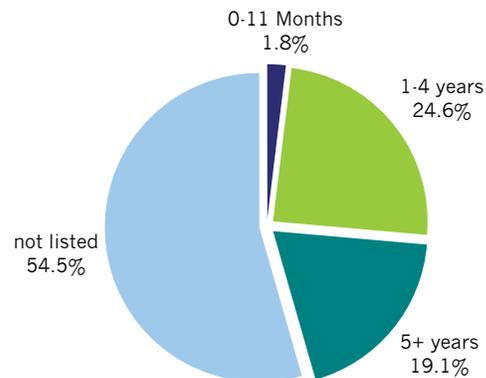
Educational requirements are lacking in a lot of online job postings. Yet, when educational requirement is specified online job ads tend to have a higher educational requirement than is seen in the broader workforce.

| Education | Job Ad Volume |
|--------------------------|---------------|
| Not Listed | 56% |
| Masters and above | 2% |
| Bachelors | 23% |
| Associate or High school | 4% |
| High School/ GED | 15% |

Experience

Of the online job ads listing experience, about 60 percent require one to four years of experience and 40 percent require five or more years of experience.

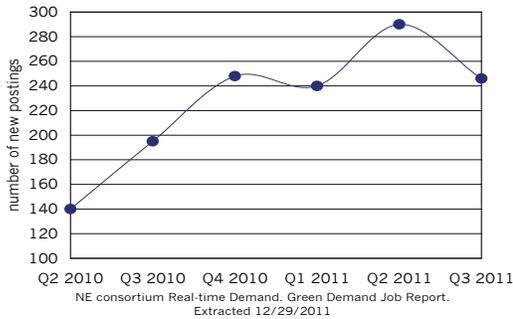
Experience Requirements Online Job Ads



A Look at New Hampshire's Green Skills and Jobs Through the Lens of Online Job Ads (real-time demand)

Online job data, known as real-time demand data, shows some discernible trends for green skills job ad volume within New Hampshire. In this case, green jobs are measured by counting job postings that contain any green skills terminology within the text of the job ad.* An analysis of data from April 1, 2011 through October 31, 2011, found 628 de-duplicated green job advertisements for the entire the state, making up about two percent of all online job volume for the state during that time period.

**Green Skills Job Ad Postings
for New Hampshire**



The top occupational job family** with green skills job postings was Architecture and Engineering comprising about 25 percent of the total green job ad volume. Most of these postings were for various types of engineers such as manufacturing engineers and regulatory engineers.

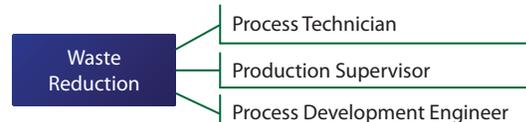
| Top Job Families with Green Skills | Job Ad Volume |
|--|---------------|
| Total Postings | 628 |
| Architecture and Engineering | 152 |
| Management | 86 |
| Production | 50 |
| Computer and Mathematical | 48 |
| Installation, Maintenance, and Repair | 46 |
| Healthcare Practitioners and Technical | 41 |
| Life, Physical, and Social Science | 37 |
| Office and Administrative Support | 30 |

Q2 and Q3 2011, de-duplicated New Hampshire job ad volume (vetted data)

* Green Skills are a set of pre-determined vernacular developed by the Northeast Consortium, computer parsing software finds, extracts, and catalogs this vernacular from online job ads.

** Occupational families are broad groups of occupations that share particular job tasks or are of a similar job type.

For all green skills postings in New Hampshire over the six month period, the top green skill was Energy management. This broad skill could be important to many different types of jobs; yet it was most commonly associated with the following job titles: Software developer, Solutions engineer, and Global product manager. The charts below highlight the top five green skills with their corresponding top job titles. Many of these job titles are not new, what is new is the emerging green job tasks that have added an additional layer to already existing skills and knowledge.



A Look at New Hampshire's Green Skills and Jobs Through the Lens of Online Job Ads (real-time demand)

Within green skills job postings there are numerous non-green skills that are also required for the job. The top three non-green skills listed were writing, supervisory skills, and communication, respectively.

There were some New Hampshire employers that frequently posted ads requiring potential candidates to have green skills.

It should be noted that the aggregated employer data shown below contains very small numbers. Even when using a six month period for New Hampshire, the green skills job ad volume is still quite low.

| Green skills: Top employers | Job Ad Volume |
|--|---------------|
| Philips Electronics North America Corp | 22 |
| Velcro USA Incorporated | 12 |
| Smiths Medical MD. Incorporated | 11 |
| Flexenergy Energy Systems Inc | 9 |
| Dartmouth College | 7 |
| Hypertherm Incorporated | 7 |
| Student Conservation Association | 7 |
| URS Corporation | 7 |
| B/E Aerospace Incorporated | 6 |
| Liberty Mutual | 6 |
| Loon Mountain | 6 |
| NextEra Energy, Inc. | 6 |

Q2 and Q3 2011, De-duplicated New Hampshire job ad volume (vetted data)

| Top Green Skills Certifications | Job Ad Volume |
|----------------------------------|---------------|
| Six Sigma | 13 |
| Forklift certification Six Sigma | 7 |
| LEED | 5 |
| Black Belt Green Belt | 4 |

Healthcare Benefits: This field requires substantial canonization (standardization) of the phrases used to describe benefits. Benefits posted include medical and healthcare, vision, dental, paid time off, paid disability, on site childcare, etc. Study of this variable could give insight into the benefits offered by employers with less lag time than a traditional benefits survey.

Job Type: This field indicates if a position is full time, part time, permanent, temporary, or contract. Currently, 43 percent of postings do not include this variable, and the variety of keywords which can be used to describe job type are too numerous to add value. Splitting this variable into two columns (full time/part time and permanent/temporary) could be more useful to observe any changes in the job posting market.

Tax Term: A variant of “Job Type,” this field indicates if the position is self employed, contractor, employee, etc. As with “Job Type,” it could offer insight into staffing patterns and worker classifications.

Online Job Ads Versus Other Methods of Advertising Jobs

Early in the research process, the question of how employers advertised job openings arose, and in particular, how employers with limited internet access advertised for workers. To begin answering that question, newspaper job ads in Colebrook, Laconia, Berlin and Manchester were compared to job ads posted to New Hampshire’s NH Works Job Match System (JMS) to see if employers advertised in print, online, or both. The goal was to learn about posting trends in areas with lower connection speeds or unreliable internet access, and compare it to an urban area (Manchester). Research was conducted during July 2010.

Comparison of online job postings to those in print showed that the type of employer (small business versus large corporation) or the type of job (management versus front-line staff) had more to do with how or where a job is posted than location. Industries such as construction and building trades, transportation, and personal services, advertising for bridge workers, mechanics, CDL drivers, roofers, or home health aides, were generally posted only in the newspaper. These industries may also advertise using methods not captured in an online job search or in newspaper ads, such as a sign at their work site, word of mouth, or through a union hiring hall. Those looking to gain entry into these industries should recognize that the newspaper is still an important job search tool, and an exclusively online job search is less likely to yield successful results.

Mid- to upper-level jobs usually requiring several years of experience were generally posted both in the newspaper and online, as were jobs for corporations or large employers. Lower-level, seasonal, part time or irregular jobs were posted only in the newspaper. In addition,

some newspapers maintain separate content for print and online versions of their publication. For example, the online edition of the New Hampshire Union Leader, UnionLeader.com, does not list job postings but links job seekers to Monster.com, and help wanted ads found in the print versions of the newspaper were found neither on Monster.com nor in the NH Works Job Match System. Many job seekers turn exclusively to the internet for their job search, but ELMI found that many jobs posted in the help wanted ads do not make their way into JMS or other online job databases.

What does this mean to job seekers and those assisting job seekers? Increasingly, the internet is being used as the exclusive method for job searching. Applications are frequently submitted online and “no walk-ins” is a directive seen in job ads more and more frequently. The wide variety of job search engines range from the all-encompassing to industry-specific health or hospitality sites. By inputting search criteria, the user is presented with targeted job postings to which they can apply. While newspaper help wanted ads requires searching through all job postings to find openings, and the local nature of these ads may mean the job seeker needs to look through several papers to increase the number of job postings they find, use of newspaper ads should not be dismissed in favor of exclusive internet searches. And though particularly evident in more rural areas, the usefulness of examining alternative job advertising methods applies to job seekers in urban areas as well.

The Green Economy in New Hampshire

Green Jobs Survey Summary and Key Results

The Green Jobs Survey was designed to evaluate and expand upon knowledge about New Hampshire's green economy. After reviewing green industry studies from other states, looking at green skills through real-time demand, creating the green firms list, and examining employer posting behavior, the Green Jobs survey was developed to fill in some of the knowledge gaps about green firms and workers. The survey's primary focus was to obtain information on preferred job advertising methods, required worker certifications, and training needs of green firms. Another goal of the survey was to gather information about green firms that typically do not post job openings online, such as establishments engaged in *Construction and Agriculture, forestry, and fishing*.

A review of literature published by other states conducting a green jobs survey showed that those who surveyed a random sample of all businesses to obtain information about green businesses had a relatively low response rate. While the response rate for all survey participants was typical for a survey, the share of respondents that considered themselves green was quite low — sometimes just one to two percent. For the New Hampshire green jobs survey, it was decided to use a targeted survey method, surveying only businesses that were presumed to be green. The goal of this method was to obtain information about a larger sample of businesses that considered themselves green, as opposed to blanket knowledge about both green and non-green firms.

The surveyed green firms included businesses involved in renewable energy, energy efficiency, or environmental protection and sustainability. These presumed green firms were identified based on the ELMI definition of green business activity, which is those producing a green product or providing a green service, or those that use green practices or green processes.⁸ In total, the Green Jobs Survey was sent to more than 900 New Hampshire businesses located throughout the state and encompassing multiple industries.⁹ The selection of survey recipients proved effective, with 85 percent of respondents identifying their company as green. The majority of respondents selected renewable energy or energy efficiency as their company's primary line of work.

The Green Jobs Survey also asked participants about worker job duties within green companies. Responding green businesses reported employing 1,890 green workers, yet at the same time, total employment of 6,003 was reported, making approximately one in three workers at the responding green businesses a green worker. The survey found that industry was a factor in the number of green workers, especially construction. For example, only one in

⁸. New Hampshire Employment Security's Economic and Labor Market Information Bureau's definition of green products, practices and processes can be found on page 5 of this paper.

⁹. The survey response rate was 34.5 percent

eight manufacturing workers were identified as green workers, compared to seven out of ten construction industry workers.

When asked about specific green certifications that might be required of workers, 38 percent of responding businesses stating that their business required green building certifications, and 37 percent required certifications related to renewable energy/energy efficiency.¹⁰ These figures are substantial compared to only nine percent of respondents who required NH Department of Environmental Services (NH DES) certifications, the next largest number of responses.

While the number of green firms requiring green building certifications is notable, the Green Jobs Survey results should not be used in isolation to identify green worker qualifications. Only half as many manufacturing firms responded to the green jobs survey as construction firms, and construction firms typically have lower employment than manufacturing firms. The unequal response ratio gives more weight to construction. To create a more complete picture of certification requirements, analysis of online job postings was conducted over a six month period. It showed that green building certifications (LEED) ranked second to Six Sigma certification.¹¹ Six Sigma training and certification is most commonly achieved by green manufacturing supervisory workers in New Hampshire.¹²

The Green Jobs Survey also asked green businesses about green worker skills, both basic and green-related. The survey asked about the importance of basic skills for green workers, such as math, writing, communication, customer service, and computer skills. Respondents overwhelmingly ranked communication and customer service as the most important skills. Also, just under a third of respondents indicated that workers lacked basic skills such as math, computer, writing, and communication skills. Over half of the respondents indicated that workers needed specific green skills. The most frequently selected specific green skills were knowledge of renewable energy, environmental education, and environmental regulations.

Green businesses were asked if current workers had training needs, and what method of training was used. Over three-fourths of respondents indicated that green workers had training needs, and four out of five respondents indicated that training was conducted on-the-job. In addition to green workers needing green skills, many green businesses in New Hampshire provide on-the-job training to help workers attain those skills. These results support the idea that, for most businesses, going green requires changes to incorporate new green processes, practices and products, which must be taught to employees.

10. New Hampshire Green Jobs Survey. Nov 2011. Economic and Labor Market Information Bureau, New Hampshire Employment Security. <www.nhes.nh.gov/elmi/products/green-job-projects.htm>.

11. Real-time demand data. Green Skills job ads, de-duplicated data, for all job families in New Hampshire from April 1st 2011, through September 30th 2011. 3.0.1 Parser data Burning Glass data.

12. Green Manufacturing in New Hampshire. Jan 2012. Economic and Labor Market Information Bureau, New Hampshire Employment Security. <www.nhes.nh.gov/elmi/products/green-job-projects.htm>.

The Green Jobs Survey indicated that the green segment of the economy is an area of potential growth, with about two-thirds of survey respondents anticipating hiring new workers over the next two years. The survey also asked employers about the way job openings are advertised. It was assumed that job posting trends would be related to firm size and industry, and the occupation of the available position. The responses were mostly as expected, corresponding to previously conducted research on job posting behaviors.¹³ Interestingly though, green businesses selected word of mouth referral as the number one overall preferred job advertising method. This cannot be understated for New Hampshire job seekers as it indicates that networking and referrals play a big role in recruitment practices for green business. While further research is needed, it suggests that non-green businesses share similar recruitment practices.

Green Industry Papers

To learn how, or if, there is a shift towards green, and how New Hampshire businesses are incorporating green processes or practices, we took an in-depth look at several industry sectors. Overall, it was found that there are different motivations and consequences for embracing green, some of which are industry dependent. However, one underlying commonality between all industries was the financial incentive gained by businesses that increased their energy efficiency. Industry sectors examined were Construction, Manufacturing, Leisure and Hospitality, Retail and Personal Services, and Transportation.

Green Construction in New Hampshire

According to the U.S. Green Building Council, the green construction market has grown dramatically and should continue to grow.¹⁴ In New Hampshire, there are several membership organizations for home builders, construction companies, and other building professionals that offer certifications in energy-efficient design and building techniques and use of environmentally sustainable materials. These organizations train and qualify construction workers to meet new building code standards as well as to meet customer demand for more energy efficient and environmentally friendly structures.

With any emerging sector, assessing quality and standards can be difficult. In order to appraise and accredit individual professionals and individual projects, certification programs have been developed to distinguish green buildings and green builders from their non-green counterparts. Many construction-related certifications apply to both individuals and to structures. Educational programs, certifications, and accreditations for the construction industry are being offered by well-established professional and membership organizations

¹³. JMS section of paper located on page 20.

¹⁴. "Green Jobs Study." Nov 2009. Booz Allen Hamilton for U.S. Green Building Council. 29 Jun 2011. <www.usgbc.org/ShowFile.aspx?DocumentID=6435>.

in New Hampshire. These certifications have rigorous requirements to ensure that green construction follows quantifiable guidelines with marked energy efficiency improvement over non-green construction.

Green Manufacturing in New Hampshire

There are numerous New Hampshire-based manufacturing businesses that have incorporated renewable energy, energy efficient and environmentally responsible processes or green practices. Strategies, guidelines and certifications for green manufacturing have been developed by private business as well as state and federal government agencies. These include:

- Lean Manufacturing, which aims to eliminating processes where resources used do not result in value added to the product;¹⁵
- Environmental Management Systems (EMS), a voluntary way for an organization to develop and maintain environmental policies; and
- ISO 14001, a set of environmental management standards that lists requirements and guidelines for an EMS and identifies standards for all environmental aspects of labeling, performance evaluation, auditing, life cycle analysis, and communication.¹⁶

Worker skills and knowledge are usually a large part of maintaining green manufacturing standards. Companies adhering to ISO or EMS regulations train their workers in environmental processes and practices. Unlike the construction sector, certifications in the manufacturing sector generally apply to the business and not individual workers. However, workers do need to be trained on the new processes and procedures required for compliance. Workers have the opportunity to gain some certifications, but unlike the construction sector, worker certification can usually only be gained while working for a certified employer. For example, a construction worker can independently become BPI certified, but a manufacturing worker can typically only gain Six Sigma certification if employed at a Six Sigma certified business.

In New Hampshire, the acquisition of a green manufacturing certification is usually based on management decisions, as the certification can require significant management training to properly implement. For manufacturers, reductions in time, energy and electricity costs, and client demand are as much the reason for obtaining certification as environmental benefits achieved.

¹⁵ United States Environmental Protection Agency. Lean & Environmental Performance. 24 Nov 2010. <www.epa.gov/lean/performance/index.htm>.

¹⁶ International Organization for Standardization. ISO 14000 Essentials. 24 Nov 2010. <www.iso.org/iso/iso_catalogue/management_and_leadership_standards/environmental_management/iso_14000_essentials.htm>.

Leisure and Hospitality

When a business in the leisure and hospitality industry chooses to incorporate energy efficiency and environmental stewardship into daily practices, management and staff are not the only people involved in succeeding. They must also ensure that guests understand the conservation ideology behind green practices, so that patrons do not misconstrue green practices with “cutting corners.”

In New Hampshire, green teams are an emerging organizational dynamic in the hospitality industry, with both management and staff participating as team members. Firms throughout the industry reported having green teams, which are deemed effective because they allow for input and collaboration from managers and staff in different departments. The green teams allow managers to become familiar with what is working and, equally important, what changes are not working at the business. One local business noticed that by establishing a green team, not only did green practices become more efficient, there was higher worker retention.¹⁷

In the leisure and hospitality industry, green certifications and accreditations are awarded to the business itself, and not to individuals.

Retail and Personal Services

For New Hampshire based retailers, the green economy is largely product-driven. Green retailers have typically emerged after identifying a gap in availability of products in their local area and offer environmentally friendly products or services to consumers to fill that gap. Green retailers may cater to a specific niche market or offer a broader selection of goods, giving consumers more energy efficiency or environmentally friendly product options. Personal service providers, such as salons or dry cleaners, typically offer a traditional service in a manner that is either free of chemicals or better for the environment than the usual practice.

The greening of retail and personal services is different from the other industry sectors described. Unlike companies with motivations to embrace green that are as much about the bottom line as about environmental protection, green retail and personal services exist almost exclusively due to consumer demand. There are certifications in this industry that apply to the process or product, such as green dry cleaning or green cleaning products. More generally, however, green retailers and businesses exist because the owner cares about providing a green product or service and there is a customer base willing to purchase the products.

¹⁷. Multiple phone interviews were conducted, notably with Gene Ehlert, Mountain View Grand, 4 Jan 2011 and Sarandis Karathanasis, The Red Blazer, 20 Apr 2011.

Transportation

The Transportation and Warehousing sector includes establishments providing transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities related to modes of transportation, by air, rail, water, road, or pipeline.¹⁸ This industry by its very nature uses high volumes of fossil fuels, presenting great opportunities to identify how resources are used and how to incorporate efficiency into and reduce the environmental impact of everyday practices.

Unlike many other industrial sectors examined for green practices, transportation does not have many green-related certifications. In lieu of certifications, many businesses in the transportation sector have embraced green practices that reduce fuel usage. Within the Truck Transportation subsector, certifications related to fuel efficiency, emissions, and waste reduction do exist for businesses. These certifications are recognized, and sometimes demanded, by business customers as a condition of doing business. All certifications relate to the actual carrier or business and not workers. One such certification, developed by the U.S. Environmental Protection Agency, is SmartWay[®], a program that aims to reduce emissions by creating incentives to improve supply chain fuel efficiency. The SmartWay Technology program helps transporters identify equipment, technologies, and strategies that improve fuel usage. The SmartWay Vehicle program also ranks passenger cars and light trucks for fuel efficiency and reduced pollutants.¹⁹

Summary of Green Papers

All of the industries profiled have identified a competitive advantage in either offering green products and services or modifying their existing processes or practices to incorporate green options. Many businesses in these industries have multiple incentives to embrace green technologies or processes: lowering production costs, reducing waste, or gaining market share of consumers to whom such issues are important.

Construction sector certifications such as LEED are among the most well-known standards for energy efficiency. New building regulations, state and federal incentive programs, and increased consumer demand offer motivation for business to invest in attaining certifications. Examples from the Manufacturing, Leisure and Hospitality, and Transportation sectors illustrate how embracing green practices result in cost savings by reducing inputs required for production as well as reducing waste.

Incorporation of green practices and processes can be cost driven, with a focus on reducing operating costs. Obtaining green certifications opens up business opportunities, thus altruistic

¹⁸ North American Industry Classification System (NAICS) definition

¹⁹ U.S Environmental Protection Agency, SmartWay Program, <www.epa.gov/smartway>.

intentions may or may not be a factor in undertaking efficiency improvements. Regardless, the outcome is the same — a green economy. Additionally, some companies specifically seek sub-contractors or production partners with environmental certifications. Green hotels might only choose suppliers who offer green products, and green manufacturers might only ship their items on green transportation carriers. Businesses that have not embraced green or have not attained the required certifications would not meet the qualifications for bidding, thus giving a competitive advantage to those firms that have.

There is room for energy efficiency and environmental stewardship up and down the supply chain. While green is an emerging part of the market, those industries and individual businesses that embrace it not only stand to save on energy costs in the present, but are positioned to be stronger when and if “green” becomes a more significant part of the broader economy.

Making Green Real: What We Learned

The Labor Market Information Improvement Grant and our partnership with the Northeast Consortium was a valuable learning opportunity for the New Hampshire Economic and Labor Market Information Bureau staff. Though the project started out with a plan to gather information about the green economy by looking at online job postings, the use of that method exclusively was not possible. By utilizing multiple paths, a great deal was learned about both real-time demand data and the green economy in New Hampshire.

Analyzing Online Job Ad Data

- **Reality did not meet expectations.** Based on published data from other vendors, we expected to have data that covered the universe of occupations and industries, and would be useful at sub-state levels. After “looking under the hood” of online job ad data, this turned out not to be true. Job ads posted online are prevalent in some occupational areas and non-existent in others. The postings are usually vague in geographic location details, and frequently do not include information that we’d hoped to analyze such as salary, educational requirements, experience requirements, and required skills.
- **There is still a great deal of analytical and procedural work to be done.** Initially, we expected to obtain a complete and standardized set of data. But this project turned out to be more “bleeding edge” than previously thought. At the present time, the data still requires intensive (costly and time-consuming) review by knowledgeable analysts. We are only part way up the learning curve in developing a standardized methodology for extracting, analyzing, and publishing reliable volumes of real-time data.
- **The information extracted from the postings data is still a useful tool, if used appropriately.** This information is particularly indicative of rapidly changing trends in technology when used in point-in-time contexts. It could also be a useful tool for employment counselors, identifying employers with high posting levels for select job titles. Some occupational areas are well represented in the data, offering good insight into the market for those fields with much less of a lag time than traditional labor market information.
- **Green job requirements are still difficult to isolate.** As with any emerging sector, the key words and phrases in green fields of endeavor and their related job postings change quickly. Many key words are acutely context-sensitive, having multiple meanings when taken at face value. Other key words may be common in job postings but may or may not represent a green job duty when placed in context. The good news is that the current ability to identify some green skills in job postings indicates that with continued investment, the ability to mine green skills and certifications should be possible.

New Hampshire's Green Economy

- **New Hampshire businesses of all kinds have embraced energy efficiency and environmental sustainability.** Some have done so because green practices had a positive impact on the bottom line, saving money on energy expenditures and waste reduction as well as meeting customer demand. For others, the desire to promote conservation strategies that help protect the natural environment is very important, and engaging in environmentally sound practices have not only met that need, but met the same need for their customers.
- **“Green” is not a blanket label that can be applied to occupations or industries.** A survey of New Hampshire’s employers considering themselves green estimated that about a third of their workers are green. This share differed among industries — seven out of ten workers in the construction industry were considered green, while one out of eight workers in manufacturing and three out of ten workers in renewable energy/energy efficiency were considered green.
- **Approaches to energy efficiency and environmental sustainability differed by industry sector.** Businesses in manufacturing more commonly use environmental management systems, ISO standards, Six Sigma, or similar programs to attain a level of certification in efficiency and waste management. Transportation businesses are largely focused on fuel efficiency. For firms in construction, building design and materials are key to energy efficiency. For retailers and personal service providers, customer demand and niche markets drive the sale and use of green products.
- **Green jobs have not met expectations for job creation, especially for those without postsecondary education.** The green economy has been touted as a route to job creation. Blue-collar jobs would become “green-collar” jobs, providing employment opportunities for disadvantaged workers. The Northeast Consortium’s research did not support those expectations. Green jobs were found not to be specific positions, but layers of additional skill attained by qualified workers, most with some level of postsecondary education. For example, an architect must first achieve professional qualification, then obtain additional training in green building design. A green builder or an organic farmer still needs to know the basics of building or farming before adding green knowledge and skills. While there certainly are employment opportunities for those choosing to add green skills and certifications, the green industry sector has yet to materialize.