

Measurement and Analysis of Green Jobs:  
Report of the WIC Green Jobs Study Group Work Session Discussion  
July 2009

**Section 1: Introduction**

State Labor Market Information (LMI) units and the U.S. Bureau of Labor Statistics (BLS) are actively examining potential methods to measure and analyze the employment needs of the greening economy. Several state LMI units already have undertaken surveys or analyses of “green” jobs and published reports. With an increasing number of private and public sector initiatives directed at alternative and more efficient energy usage and a cleaner environment, there is growing interest in a nationwide employment statistics system that can provide employment data on the “greening” economy. This is the first paper of the Workforce Information Council (WIC) Green Jobs Study Group (Study Group) addressing green jobs measurement methods and alternative approaches. It provides a descriptive report of the WIC Green Jobs Study Group Work Session on the Measurement and Analysis of Green Jobs, held on July 16-17, 2009, in San Diego, and is intended to inform state initiatives to measure and study green-related employment.

The Study Group was chartered by the WIC on March 12, 2009, with the objective “to develop a proposal(s) on how the employment statistics system can respond to the needs for information about the number, types, and characteristics of green jobs.” Three goals were established in the charter:

1. Define green jobs and what needs to be measured about them
2. Develop alternatives for measuring green jobs, including costs of measurement
3. Develop a specific action plan to collect and publish the information required by policy makers

A detailed report by the Study Group addressing the first two goals is scheduled for release in September 2009. As part of the input to the planned report, a work session of Study Group members and states that have undertaken surveys or other studies of green jobs was convened on July 16-17, 2009. The principal participants were Study Group members as well as invited representatives of other states that have conducted surveys or analyses. State studies or plans discussed were from California, Connecticut, Florida, Michigan, Minnesota, New York, Oregon, and Washington.

A number of state LMI units are currently investigating or planning to undertake green jobs surveys or studies. To help meet this immediate need, the Study Group decided to make the information from the July 16-17 work session available now rather than wait for the more detailed analysis of the information in the Study Group’s report. This paper provides a descriptive report of the study session. The discussions by the participants have not been analyzed or categorized, but simply reported back and organized as presented in the agenda.<sup>i</sup> While the paper summarizes some comments, it maintains the points made by each participant and does not consolidate comments by different discussants. Indeed, discussants making similar observations on their studies may provide important insights on similar issues and approaches.<sup>ii</sup>

The exception is Section 3: *Lessons Learned*. This was the last discussion of the work session. In this case participant observations are grouped into categories as a means of organizing the comments that were provided through a simple round-robin session. The lessons learned are presented in Section 3 as a means of highlighting some of the key observations made by participants. Many readers may choose to just read the first seven pages of this report to get many of the highlights. Others who may be contemplating a state study may benefit from reading the remainder of the report to get a greater sense of the range of issues and ways in which states addressed them.

In general this paper does not refer to individuals but rather references the state as a means of conveying the wide range of information from the work session.

## **Section 2: Purposes and Background of the July Work Session**

The principal purpose of the work session was to “share and capture knowledge and experience of states that have already conducted green jobs surveys or in-depth analyses, resulting in learning that will be made available to all states, BLS, and ETA for future use in measurement efforts.” Of particular interest was the process and thought behind how states defined green jobs, the development of the survey or analytical process, and the measurement approaches, i.e., the thinking behind the methods and processes selected. What resources and groups were involved in the process? What feedback or pushback did states get on the definitions, processes, or findings? This information should be invaluable to informing future state, BLS, and ETA initiatives related to measuring green-related employment and identifying skill needs.

The work session was not intended to develop a consensus on green-related definitions or measurement but rather for information gathering from state LMI units that provide a real world laboratory of green job measurement. The Study Group’s September report will consider alternative definitions and methods more critically.

Importantly, the work session was not a platform for advocacy or criticism of other green job studies or policy, but provided a stage for LMI professionals to discuss their experience and the range of issues confronted in measuring green jobs.

The agenda for the work session included the following discussant sessions:

- Discussion of Green Definitions
- State Survey Discussion
- Analytical Approaches – use of LMI and other resources in lieu of or in conjunction with survey based data
- Dissemination of Green Jobs Information: including new ways to get information out to users
- Lessons Learned: Experience Each State Has Gained

### **Section 3: Lessons Learned**

The Study Group work session concluded with a round robin discussion, each participant indicating what particular lessons they learned during the meeting and/or in their study. Nearly 100 comments were offered. Though this paper does not provide a detailed analysis of all of the comments, there were several clear themes and ideas that percolated to the top. This chapter summarizes those lessons learned and some crosscutting elements identified during the work session and serves as a summary of key points that may be of interest to the reader. The detailed descriptive comments from the session are lengthy and complete the remainder of the paper, providing a source for readers who wish more information on a particular topic or state study. However, this section does not suggest any consensus but rather serves as a simple reflection of a range of issues and solutions that any survey or analysis of green jobs is likely to encounter, at least in part.

#### ***Green Definitions and Planning a Green Jobs Study***

A key point highlighted two ways in which the greening economy might be studied:

- Survey approaches
  - Measuring the number of green jobs (Washington, Michigan, Oregon, California)
  - Identifying green practices, skills, etc. (Minnesota and California)
- Analysis of existing labor market information (New York, Connecticut, Michigan) without a survey or in conjunction with survey data. An analysis without a survey can focus on industries and occupations most likely to be impacted by green economic activity – without necessarily developing a baseline estimate of green jobs.

Given the current direction in defining green jobs, a survey approach appears to be the best method of estimating green jobs, because no amount of analysis can isolate green-related employment by occupation or industry to actually measure the number of employed. The combination of a survey with analysis of LMI and other resources provides, not surprisingly, the preferred means to develop a more comprehensive picture of the greening economy and employment.

Regardless of the methods to be used, each study, survey, or analysis must have

- Clearly defined goals and purposes and identify what is to be measured;
- Solid definitions of terms and a clear vision of the result or end goals;
- Definitions and procedures that have been vetted by key stakeholders and build in time to fully engage partners;
- Good knowledge of customers and their needs to determine the type of information to be collected and analyzed.

All of these factors help determine the methods that will be used -- surveys, analysis, or a combination of both. The purposes and goals also will play a role in setting the survey or study design. Two cautions were raised:

- The potential of scope creep must be considered:
  - The risk of serving multiple masters can become real and overburden a survey or study.

- There is a fine balance in vetting definitions and methods and reaching a consensus.
- One approach is to vet definitions and methods through a large group, but pursue final consensus with a smaller group using input from the broader range of partners.
- A second caution was to keep the study outside of a particular organization's interests – LMI must be objective and independent of any vested interests.

The various surveys undertaken clearly identify the “job” as the common unit of observation, certainly when it comes to measuring green employment.

- By collecting information on “green” jobs, in theory it is possible to do internal microanalysis of establishments that have green jobs and analyze and publish information on green-related occupations and green-related industries.
- Estimates of green jobs can be aggregated at the industry and occupational level using the NAICS and SOC systems.
- Understanding that the job is the key point of observation is critical to defining green employment and the design of the survey process and instrument.

A common thread in each of the surveys and the analyses is the recognition that measuring and analyzing green jobs is different from the traditional measurement and analysis of occupations and industries.

- What is really being measured is employment that impacts on energy usage and environmental health.
- This leads to a fundamental aspect of defining green jobs -- each job is defined in the context of green economic activities, such as increasing use of renewable energy, improved energy efficiency, reducing pollution and the carbon footprint
- Washington, California, Oregon, and Michigan each have definitions that tie directly to green economic activity, though there is some variance in the activities.

To measure green jobs, some states used an additional qualification of a basic definition. The general definition is made more specific on the survey instrument in several ways including:

- The surveys specify that for a job to be green the work must be *essential* to one of the green areas or the *primary function* of the job is directed at one of the core green areas. California uses a variation, including *any job related to a green activity* and of those, the *jobs in which 50% of time* is spent on green activities.
- The survey instrument defines each of the green economic activity categories and often provides examples and in the case of Oregon also items that should be excluded as green – several of the participants liked the Oregon guidance of “what’s in and what’s out.”
- It is useful to include some reference date for data collected on the survey, such as jobs in the last three months, by year such as 2008, or a statement like current jobs.

Several participants raised interesting issues related to definitions:

- The idea that the “greening” of the economy may be a better characterization than the “green economy.” The latter implies, to many, a separate economic sector or a sub sector of the overall economy. The former may better recognize that green activity is crosscutting

involving jobs in many industries and occupations. This is much more reflective of green economic activity.

- The use of the term “green jobs” raises many different opinions and awakens political and philosophical interests, so it may result in response bias on surveys. Some participants indicated that it might be useful to simply classify jobs by the economic categories they impact and not use the term green jobs. But pragmatically it may be difficult to move away from the usage of the term green jobs simply because it has become so prevalent – that of course can be a plus or minus, and most likely both.
- The notion that the concept or definition of green can change over time. For example, is a product that is energy efficient today still energy efficient five years from now relative to more efficient products that may be developed? By implication, shifting definitions of green products and services over time could impact counts of workers involved in those activities. At this time, the primary interest of many states and BLS is to develop baseline estimates of green-related employment, so this issue is not crucial today, but could be of greater import in the future.
- Definitions can have a unique feature based on particular state interests or policies. For example, Michigan included Clean Transportation and Fuel as a separate green economic activity category because of Michigan’s industry and labor market. Other states might include jobs related to this area under renewable energy and/or energy efficiency. Having different green economic activity categories does not necessarily mean that states are counting different jobs, but it is important to carefully define the categories to ensure they encompass the range of green work to be measured.

Participants noted there is

- A need for flexibility within a state to define green jobs;
- A need for a national survey that establishes a standard set of definitions and methodologies;
- Keen interest that such data be developed at the state and sub-state level, recognizing that this is not likely in any initial national survey.

Some general observations on the surveys and definition related to the working BLS definition included:

- Most definitions and surveys emphasized jobs associated with green products and services.
- Some of the surveys may pick up jobs related to green processes within a business, whether or not it produces green output.
- None of the surveys directly address the supply chain, but to the degree that industries in a green supply chain indicated they have green jobs, it is likely that some jobs are being collected.
- However none of the surveys differentiate where jobs are in the supply chain. This might be an area for further research by looking at Department of Energy input-output models and studies of supply chains. Such information might help explain and analyze survey findings.

### ***Survey and Analytical Methods and Tools***

- Michigan indicated that they use components of the Job Vacancy Survey (JVS) software to develop their survey sample – a number of states were interested in the potential of using this approach. For information on the Job Vacancy Survey see: <http://www.jvsinfo.org/tools.htm>.

- Several states noted they received assistance from regional or national BLS staff and from some of the other states that implemented green job surveys.
- The survey states indicated that greater integration of survey data and traditional LMI, as appropriate, would be worthwhile in future studies and reports.
- Several states noted that the Autocoder software was effective in coding jobs to the SOC and that generally most jobs were relatively easily coded to appropriate NAICS and SOC categories.
- Formal cognitive review and pre-tests were recommended to improve response rates and validity, and to reduce response bias. While most of the first surveys had satisfactory response rates, over time it will be important to raise those rates – a national survey would require higher response rates. Also, unclear or poorly worded questions can deter response, elicit biased responses, or produce information that is not what was intended to be studied.
- It was clear from the state discussions that the survey requires extensive follow-up to get acceptable response rates. The mail-in responses generally are low particularly without follow-up while there is more success with the phone interviews.
- Oregon and California offered an online response options. Oregon reported that the online survey response tool was very effective. California’s online response software allows users to save partial responses and return later to complete them, a highly desirable feature, particularly if a survey is more complex or requires more than one person to respond. Discussants noted that built in logic tests are useful to online and data entry tools.
- Of interest to participants was a reference from BLS that some research has shown that offering a larger number of response methods in the initial contact or mailing package can lead to a somewhat lower response rate.<sup>iii</sup>
- BLS indicated that the state experience has suggested that BLS should plan for extensive non-response prompting especially on a one or first-time survey.
- One desirable feature of a survey is to minimize handoffs at the establishment – ideally to design the survey so one person can provide the response.
- Training phone interviewers proved very important in collecting data by phone or following up with nonrespondents to the green job surveys.
- Preparing questionnaires that include the definitions and descriptions is important both to response rate and quality of the responses.
- The enclosures including endorsements and instructions that accompany the questionnaire could be very important to the success of the survey.
- Some feedback during the lessons-learned session was on whether surveys should focus on green-related industries or possibly over sample industries that have been so identified.
- One issue was how to handle phone responses. Some states indicated it is important that the interviewer not provide any direct advice on whether to categorize any item as green or not, and that the respondents self-identify green jobs.
- BLS and several participants were interested in additional analysis including:
  - The value of looking at how much growth comes from existing firms versus births – might provide some linkages to other things like venture capital and patents
  - Examination of companies that responded that they have green jobs to see how long they have been in business and to compare green to non-green businesses.
  - Explore other business dynamics
  - Mapping micro data job titles back to SOC can inform the BLS effort.

- Limitations of SOC/NAICS to answer questions of greening; demand for information goes way beyond the classification systems to address the topic. NAICS and SOC are good tools but may limit how far we can go within those structures, though over time each system provides methods to request changes.
- No one identified new jobs – it was not clear whether that was because everything is forced into the SOC. Oregon noted that it had discussed how to code wind turbine technicians and solar panel installers and there was no problem mapping jobs into SOC, though adding two occupations as planned to the SOC in 2010 will be helpful.
- In general there is interest in examining micro information on job titles matched to the SOC to identify possible new or emerging jobs. Each state was asked to provide job title lists to BLS for further analysis
- BLS noted that one of its proposed surveys, if funded, would be industry based, thus there might be a need to identify green-related industries.
- There appears to be a high percentage of employers saying they have no green jobs. It is not clear whether non-respondents did not respond because they did not have green jobs. If so, a non-response bias problem exists.
- There was some discussion of how to examine whether knowledge, skills, and abilities associated with green jobs are different or are changing. This may be an area addressed by some ETA grants and over time possibly by O\*NET.
- BLS indicated that the state experience provides good intelligence for its plans to survey green industries and occupations but it is premature to identify how BLS's plans may be modified, if at all – particularly any survey specifics. It is fairly clear that the first year of the occupational survey, if funded, will not provide data to the state level.

#### **Section 4: Discussion of Green Definitions**

BLS has requested funding in FY 2010 to collect information on green-related employment, and if funded, will survey establishments to obtain relevant data. BLS's current working concept of green jobs includes:

1. Jobs involved in producing green products and services
2. Jobs involved in greening production processes, regardless of the product or service produced
3. Jobs in the supply chain to production of green products and services

Note that this is a conceptual definition and not one that BLS has selected for its survey efforts. BLS has indicated that it is unlikely that item 3 would be captured through a normal survey process.

As part of the Study Group work session,

- BLS asked states in the discussion to indicate whether their definitions covered these elements of the BLS definition to assist BLS in refining its definition based on state experiences to date.
- State representatives expressed an interest in discussing why state definitions might differ from each other and not necessarily align directly with the BLS working concept.

- At the same time, states indicated that a BLS managed survey using a standard set of definitions and consistent methodologies was highly desirable, even if some state needs might vary.

Below are highlights of discussants' comments organized by state; the same format was used in the work session discussions.

### ***Connecticut***

Connecticut undertook a brief analysis of green jobs, but did not implement a survey. There was a need to put out some information on green jobs quickly to meet growing interest. The first concern was the difficulty identifying jobs that have work directly related to improving and preserving the quality of the environment, i.e., what generally might be termed, green jobs. Such jobs exist in many segments of the economy and industries, and many such jobs entail only part of the time being spent on green-related activities. Along with several other factors, this makes it difficult to both define green jobs and to measure related employment. Connecticut did not finalize a definition of green jobs, but undertook several steps to get a better grasp of the concept including:

- Examining information in the NAICS and SOC manuals to identify potential industries and occupations that may impact on green economic activities by looking for definitions that included relevant terms such as environment, energy efficient, pollution control, etc.
- Preparing and describing three methods that provide some insight into the greening economy as well as the difficulty of quantifying the number of green jobs and industries. These methods, summarized in Section 5 of this paper, were published in *The Connecticut Economic Digest*, December 2008 that is available at: [http://www.ct.gov/ecd/lib/ecd/ct\\_digest/2008/ceddec08.pdf](http://www.ct.gov/ecd/lib/ecd/ct_digest/2008/ceddec08.pdf).

The purpose of this initial work was to set the stage for future analysis and possibly a survey to capture information on employment and how much of the economy was becoming green.

### ***Washington State***

Washington began by reviewing the literature, including the work of Connecticut and several studies available at the time, and decided that a survey was both appropriate and perhaps the only means to try to get an initial snapshot of the number of green jobs. For details on the Washington study, see the report available at: [http://www.workforceexplorer.com/admin/uploadedPublications/9463\\_Green\\_Jobs\\_Report\\_2008\\_WEXVersion.pdf](http://www.workforceexplorer.com/admin/uploadedPublications/9463_Green_Jobs_Report_2008_WEXVersion.pdf).

A number of issues were considered in defining green jobs including those below.

- Washington highlighted the *Digest of Green Studies and Reports* and other materials on the *Understanding the Green Economy* web site maintained by the California Employment Development Department located at: <http://www.labormarketinfo.edd.ca.gov/?pageid=1032> as a good starting point for research.

- The notion of green is a different conception or view of jobs, occupations, and industries – green is not based on skills or activities impacting the economy; rather, the primary focus is the impact on the environment.
- What is green is based on products and services that promote environmental protection and security in four green core areas<sup>iv</sup> as defined by Washington, including
  - Energy efficiency
  - Renewable energy
  - Preventing and reducing pollution
  - Mitigating or cleaning up pollution
- Washington met with many organizations in developing concepts, definitions, and, ultimately, the survey approach. This vetting both informed the process and promoted engagement and buy-in by other groups.
- The “measurable” definition of green jobs used in the Washington survey included *staff that worked in any of the four core areas as their primary job function either full or part-time within the last three months.*
- To Washington, the process of defining green jobs highlighted the difficulty of thinking in terms of NAICS and SOC codes when measuring employment in a greening economy, recognizing that these systems were not designed to measure such crosscutting activity.
- Washington intentionally intended its definition to be “sparse,” but clearly qualified and framed the definition in its application on the survey instrument.
- In response to a question on whether Washington might tighten up its definition and whether the definition relied too much on the respondent’s judgment, Washington indicated that the definition would remain the same in a second survey that has been funded.
  - In spite of the complexity and issues around green jobs, in general there was not an overselling by establishment on the number of green jobs (a few companies may have overestimated their “greenness,” but well trained interviewers helped minimize this potential problem).
  - Leaving the decision to the respondent to determine what is green, based on clear information in the survey process, seems appropriate.
  - The results of the survey suggest that the definition is workable.
  - While there might be some value in refining the definition, not sure how it can be tightened up.
  - Interviewers were trained to encourage respondents to look carefully at whether a job included primary functions related to a core area – it was important that no attempt was made to create larger estimates of green jobs – the key was for the respondent to make an informed judgment.
  - Only a few establishments indicated they were 100% green, and they tended to be in agriculture and small.
- Washington reviewed the NAICS and SOC manuals to determine likely candidates for green-related occupations and industries and subsequently did an industry survey to identify other industries that may have green-related jobs. (See the survey discussion later in this paper.)
- Washington indicated it was not trying to measure net impact on employment or the environment, but was attempting to establish a baseline measure of green jobs for future studies. Measuring impact on the environment is difficult. For example, is use of fluorescent light bulbs green? What if the bulbs are not properly disposed of – is it still green? In

Washington, small hydro is considered green, but large hydro is not (due to the environmental impact on the salmon population). Is nuclear power green?

- The Washington definition, as compared to the BLS working definition, focuses on products and services (part 1 of the BLS conceptual definition) and indirectly may pick up employment as part of the supply chain (part 3 of the conceptual BLS definition) if an industry in the supply chain indicates it has green jobs. However, the survey does not directly attempt to differentiate components of the supply chain. The survey definition does not directly attempt to estimate jobs related to internal production processes.

## ***Michigan***

The Governor's establishment of a "No Worker Left Behind" green jobs initiative drove the impetus for the Michigan study, with an eye toward the potential of the greening economy as a potential source of employment opportunities. Michigan faced immediate questions on how to re-employ job seekers and where the in-demand jobs are located. For more details, see the *Michigan Green Jobs Report* at:

[http://www.michigan.gov/documents/nwlb/GJC\\_GreenReport\\_Print\\_277833\\_7.pdf](http://www.michigan.gov/documents/nwlb/GJC_GreenReport_Print_277833_7.pdf).

Issues and processes considered by Michigan are highlighted below.

- The greening economy sets the context for defining green jobs. Green jobs come out of the greening economy. Similar to Washington, Michigan identified five core areas, or green economic activity areas:
  - Producing renewable energy
  - Increasing energy efficiency
  - Clean transportation and fuels
  - Agriculture and natural resource conservation
  - Pollution prevention and environmental cleanup
- Staff spent over two months vetting the definition of the green economy with the governor's office and many other organizations. This up-front work was critical to the definitions and setting up the survey that Michigan ultimately implemented.
- Michigan considered the concepts and definitions of the green economy and jobs in the context of an overall study plan.
  - A survey to estimate green jobs.
  - Limit the scope of the survey to get a good response rate.
  - The study would use LMI and other existing data, for example OES wage data, rather than complicating the survey instrument.
  - A special analysis of some green businesses was to be included in the report.
  - Focus groups on wind and solar energy and pollution mitigation contributed to the final report as a source of qualitative information.
- Michigan established a definition of green jobs as: "jobs directly involved in generating or supporting a firm's green-related products and services." This definition was used in the analysis for the report.
- The survey instrument, using the Washington survey questionnaire as a model, and supplemental materials implemented a measurable concept of green jobs as follows:
  - Green jobs include primary occupations engaged in the production of green-related products or services and support jobs created by green-related revenue.

- Employers were asked to estimate how many employees have work in any of the five core areas (above) as their primary focus (in essence the same concept as Washington).
- Michigan also provided a two-page description of examples of green-related activities in each of the five core areas to assist the respondent in making an informed judgment.
- To establish the definition and framework for the study, Michigan worked with Connecticut and an initial green job workgroup of states<sup>v</sup>, did a literature search, reviewed the NAICS and SOC manuals, considered the Washington and Pennsylvania definitions of green-related industries and occupations, and vetted definitions and other elements internally and externally.
- Respondents did not ask many questions—hopefully a sign that the two page set of examples of green activities was useful.
- The clean transportation core area was included as a separate category because of the importance to the Michigan economy. Note that items included in this category likely fit in the renewable energy and energy efficiency categories in Washington.
- To a degree, the Michigan definition covers all three parts of the BLS working definition: clearly item 1, green products and services; item 3 by surveying all industries, parts of the supply chain should be picked up (without specific differentiation); and to a lesser degree item 2 internal green processes (“business’s involved in”), though the latter is not explicit. BLS expressed interest in any ideas as to how jobs related to green processes could be more directly captured as part of a survey.
  - It was noted that it is difficult to measure employment related to green processes because it is a secondary effect tied to the environment, but was certainly an area of interest.
  - A general issue with any measurement of green was raised – green is not a static state. For example, most cars produced now are greener than autos manufactured ten years ago. Is the same car green tomorrow? One consideration is whether we can measure a change in the effect on the environment.
  - A related issue surfaced—whether employment can be tied to net impact on the environment.
- Some industries were ruled out of the survey and by implication the definitions. For example, retail stores, accommodations, and restaurants.
- Michigan briefly described the focus groups (see the Michigan report for more details). The focus groups not only provided qualitative information, but involvement of participants helped engage key players in renewable energy and pollution control.
- In response to a question from BLS on possible changes, Michigan indicated that they thought adding items that should be excluded from the green activities, as Oregon did, might be a good enhancement, providing further guidance to respondents.

### ***Minnesota***

A Minnesota Green Jobs Task Force developed an estimate of green jobs in 2008 in industries producing green products, renewable energy, green services, and environmental conservation. As in the Washington and Michigan studies, the notion of green jobs was tied directly to core green economic activity categories. As follow-up to that first survey, in the fall of 2008,

Minnesota undertook a survey of green practices and workforce needs of Minnesota (note the survey was not conducted by the LMI unit). Some of the issues and elements that were addressed included:

- The survey did not include a formal definition of green jobs, rather it was designed to capture information from businesses on green products and services, practices, and green-related skills and training needs.
- The survey does not directly correspond to the BLS working definition of green jobs, but the underlying constructs are similar. The survey focuses on products and services. In addition, the survey requests information related to the supply chain (not directly, but by soliciting information about green products) and information on practices related to green processes used within a business. Again, the survey does not estimate green jobs, but focuses on information that may be related to green jobs and green industry characteristics.
- The response rate of the survey was only 12% so the results are not statistically reliable, but do provide some sense of green business practices and skill needs. (The survey is discussed in more detail in the next section.)

## ***Oregon***

Oregon considered a number of factors and engaged many parties in developing a definition of green jobs and in implementing a measurable definition in its survey. For details on the Oregon study, see the final report *The Greening of Oregon's Workforce: Jobs, Wages, and Training* available at: <http://www.qualityinfo.org/pubs/green/greening.pdf>.

Among the issues addressed are those highlighted below.

- The study began with the Oregon Workforce Investment Board as a key customer. The survey was focused on jobs, wages, education, and any special occupational requirements.
- Oregon did not feel a review of the NAICS/SOC manuals was needed. The focus was on the job as the unit of analysis and collection – subsequently jobs and businesses would be coded to the SOC and NAICS respectively.
- Green jobs were defined as: *a job that provides a service or produces a product in:*
  1. *Increasing energy efficiency*
  2. *Producing renewable energy*
  3. *Preventing, reducing, or mitigating environmental degradation*
  4. *Cleaning up and restoring the natural environment*
  5. *Providing education, consulting, policy promotion, accreditation, trading and offsets, or similar services supporting categories 1-4*
- The definition was qualified on the survey instruments to make it a more measurable concept by including examples of what might be green and what is not green for each of the categories. The survey specifically indicated that only jobs where work in a green category was *essential* to the function of the job be counted as a green job.
- Oregon undertook an extensive vetting process and there was a lot of feedback. Some groups wanted items like a family-sustaining wage included, for example. Oregon argued that the definition needed to be neutral so as not to lose any comparability with other data sources such as wage and other LMI that can be used in the analysis about jobs.
- During the survey process, it was important that staff did not provide any hints or suggestions to respondents on whether a particular job might be green. It was key to maintain neutrality

and the judgment be made by the respondent, informed by the detailed information provided as background on the instrument.

- Oregon used *essential* as a qualifying term in the definition of green jobs rather than *primary function* used by Washington and Michigan because it believes that any job that is essential, whether it requires 20% of the time or even less, should be counted if the activity cannot be carried out without that job.
- Oregon included private and public sector jobs in the definition and survey. Washington, which included only private jobs, is likely to include public jobs in a future study.

### ***Florida***

Florida is in the process of planning a study of green jobs including a survey to measure the number of green jobs and possibly training needs. Florida has developed a valuable summary of definitions of green industries and green jobs for use by other LMI units and organizations available at: <http://www.labormarketinfo.edd.ca.gov/contentpub/GreenDigest/States-Green-Definitions.pdf>.

Florida has not published a final definition to be used in its study.

### ***California***

California is currently conducting a survey on the green economy with an anticipated completion date by the end of September. California has an Economic Strategy Panel that chose the green economy as a focus area two years ago. California has been an active member of the NASWA<sup>vi</sup> group that provided the initial forum for state workforce and LMI units to consider ways of measuring the green economy. In building a definition of the green economy and green jobs, California explored a number of issues, including those identified below.

- A broad definition of green was considered to not exclude businesses that might have green-related activities, products, and services.
- A literature review of many studies was undertaken to inform the definition.
- Vetting of proposed definitions was integral in determining final green-related definitions. Among the organizations involved were community colleges, the Employment Development Department, the Governor's office, the State Workforce Investment Board, the State's Green Collar Jobs Council, and labor and business associations.
- Similar to the other states, California tied definitions to green categories. The definition of green jobs employed in the survey instrument is: *How many employees currently produce goods and services in any of five green categories:*
  - Generating and storing renewable energy
  - Recycling existing materials
  - Energy efficient production manufacturing, distribution, construction, installation, and maintenance
  - Education compliance and awareness
  - Natural and sustainable product manufacturing (including sustainable agriculture)
- Each green category was further defined on the survey instrument.
- The California definition aligns directly with two components of the BLS definition (green products and services and green production processes). The California definition does not

align with the supply chain element, other than indirectly to the degree that respondents indicate they have green products. The survey is not designed to collect specific information on the supply chain.

- California added a coda at the bottom of their definition (posted online) recognizing the importance of sustainable practices in mitigating environmental issues, following extensive discussions with the California Green Jobs Council. The intent was to recognize the importance of green practices that generate additional demand for green products and services.
- California's survey focuses not only on jobs but business practices looking at both supply and demand, i.e., demand as related to businesses that have enabled green practices.
- The discussion noted that the job is the unit of analysis in most of the studies. While true in California as well, California expands the unit of analysis to businesses by exploring businesses practices.
- BLS raised the question on whether green jobs, green-related jobs, green occupations, or green collar jobs were synonymous. California indicated that the green collar job definition generally refers to blue-collar jobs that are turning green and that the definition typically has some social context. Green jobs is the unit of analysis at which data are collected, while green-related occupations are those occupations that "contain" green jobs, i.e., where green jobs have been coded to SOC categories. Similarly, green-related industries might be a more informative term than green industries in that businesses that are green in part are subsequently coded into NAICS categories.

Several survey-related issues were discussed during the session on definitions, as noted above. The next section covers the surveys in more detail.

### **Section 5: State Survey Discussion**

The five states that have undertaken surveys discussed the surveys with respect to several points identified prior to the session. Among the points covered by each state were

- Goals and scope of the survey
- Sample design and selection
- The collection instrument
- Collection modes and procedures
- Validity of responses on various topics
- Estimation methods
- Were there job titles that were difficult to code to the SOC?
- What was the cost of the survey?
- Are there any special technical assistance needs or tools recommended?
- What would you do differently if you were repeating the survey?

The discussion for each state covered these and other issues to varying degrees. The descriptive presentation below does not necessarily organize each state discussion by the above points (though the September Study Group report will provide an analysis against these topics), but hopefully each topic is clear in the flow of the presentation.

To shorten the presentation on sample design, response rates, and green jobs as percent of employment, refer to the three figures below.

**Figure 1: Survey Design Including Population, Sample, and Stratification**

State Survey	Population/Sample	Stratification
California	51,129 of 837,206 (private-ownership 50 & public-ownership 10, 20, 30), a subset of the 1.3 million employers in CA. Excluded employers in NAICS 814110, county codes 996 & 998	All industries at the 2-digit level and the following at the 3-digit level: 236, 237, 238, 321, 322, 323, 324, 325, 326, 327, 331, 332, 333, 334, 335, 336, 337, 339, 561, 562, 811, 812, 813. Total of 42 NAICS (2 & 3 digit).
Michigan	13,303 of 121,279 Private 691 6-digit NAICS.	3-digit NAICS, 7 MI regions, and 7 employment size classes. 250 + employment selected with certainty.
Oregon	10,436 of 68,564 Employers (Private and Public).	15 broad industry groups. Two groups were created. Certainty sample for employers thought green in industries with few employers.
Washington	17,000 of 27,000 Private firms in 110 pre-defined green-related industries.	29 WDA's & 29 3-digit NAICS industries. Firms with 200+ were sampled with certainty.

**Figure 2: Response Rates**

State	Number in Sample	Total Responses	Response Rate
Michigan	13,132	6,434	49.0%
Oregon	10,436	4,708	45.1%
Washington	15,649	9,562	61.1%

**Figure 3: Green Jobs as Percent of Employment**

State	Green Jobs	Total Employment	Green Jobs As % Employment
Oregon	51,402	1,686,524	3.0%
Oregon, Private Only	46,339	1,438,475	3.2%
Michigan	96,767	3,200,000	3.0%
Michigan, Direct & Support	109,067	3,200,000	3.4%
Washington	47,194	2,974,524	1.6%

### *Washington State*

Among the key points in the Washington survey discussion are highlighted below.

- Legislation was passed in Washington to undertake a survey related to the green economy.
- The decision was made to keep the survey simple and focused primarily on collecting information on green job employment by the four green core areas identified by Washington.
- The survey was designed to measure direct employment in green economy jobs.

- Washington chose to focus the survey on industries that were identified as likely to have green jobs, consistent with the legislation and study objective.
- Washington identified candidate industries through staff research followed by a survey to identify industries with green-related employment. 110 industries were identified for the primary survey. The survey included the private sector only. Only the 110 industries were surveyed.
- The sample used 3 digit NAICS without stratification and employed probability proportionate to size (PPS). (See Figure 1 for further detail.) Washington has staff on board with survey design expertise so no outside assistance was needed.
- Mail and telephone survey were used with primary use of phone interviews. Extensive follow-up efforts were made through letters and phone contacts.
  - Washington hired 10 telephone interviewers and provided significant training.
  - Most responses were via phone with fewer by mail. No online collection was used.
  - The survey design was intended to minimize handoffs within a responding business, i.e., ideally so one person could respond to the survey. This could impact positively on response rate and quality of response.
  - Thanks to phone and follow-up procedures, Washington's response rate was good. (See Figure 2.).
- Washington indicated that a national survey would be most desirable. Even though this gives up some state flexibility on the survey, having a standard set of definitions and methods is important. States could use other LMI along with the survey to meet unique demands.
- Washington did pretest survey.
- Washington indicated that the mode of collection was the same – even with mail out, it was important to have phone follow-ups. A Computer Assisted Telephone Interviewing (CATI) system was not used but an in-house SQL system linked interviewers to the database.
- Data were collected over a two-month period during July 2008 – September 2008.
- The mail-out included several important support materials including letters from Commerce and Labor and an environmental organization.
- Washington used the AutoCoder software developed by Bob Wilson and found it effective in coding jobs to SOC.
- Washington also tested for nonresponse bias, randomly selecting 363 firms that did not respond to the survey. Intensive follow-up was conducted with these firms to obtain at least partial responses, and these were compared to firms responding to the original survey. No differences were found, within the survey error range, thus the conclusion was reached that there was no significant response bias.
- Washington does not plan to make significant changes to a second survey scheduled for later this year, but is considering adding more examples of what might be considered green and what should not be considered green (following the Oregon example).
- The Washington overall survey results were reasonably in line with the results from Michigan and Oregon, see Figure 3 above.

### *Michigan*

- Michigan began by establishing the objective for the green jobs study to develop information on the size and broad characteristics of current green jobs and to provide a baseline to track future green employment growth.
- From the outset, Michigan designed a multi pronged research effort including a quantitative approach (survey), analytical approach (existing LMI), and qualitative approach (focus groups).
- The survey is intended to be repeatable so that future survey results are comparable.
- The survey was intentionally designed to be simple to get a good response rate and reliable responses. The multiple sources used in the study, noted above, directly contributed to this simple survey design.
- Michigan learned and used as much as it could from the Washington study, adding a fifth core green area—transportation and fuels—because of the importance in the Michigan economy to be able to analyze results at that level. Michigan also added some simple questions on employer expectations of growth and recruiting along with skills and training needs.
- Michigan adapted the job vacancy survey (JVS) approach and software to the green jobs survey.
- The mail-out package included the survey, a letter from the Commissioner of the agency, a two-page description of green job examples, and a return envelope with materials in tri-fold format.
- About 20% of all responses came in by mail (similar to JVS results), so Michigan used 10 phone interviewers to obtain remaining responses. JVS temporary staff were not available to handle the phone interviews. The interviewers were temps and received a week of training. Ideally Michigan would like to use more experienced staff for the surveys. Quality of the interviewers improved significantly during the course of the survey. Michigan noted that even though most responses are handled via phone interviews, it is critical to send out the questionnaire through the mail -- first because it does obtain some responses and second, it helps the respondent's preparation in a phone interview.
- Because of the high demand for the information, the study, initially planned as a nine-month effort, was compressed into five months.
- Support jobs were added to the survey in response to interest by the Commissioner of the agency.
- Michigan stratified sample by industry, area, and size – see Figure 1. Michigan also excluded some industries that it believed were not likely to have green jobs. Also some companies were added to the survey in industries that had few companies and might be missed in the survey process.
- Michigan did not use the Bob Wilson auto-coder but thought it might be very helpful.
- Technical assistance provided by Washington and BLS was instrumental in helping Michigan develop the survey.
- Preparation of report including analysis, focus groups, etc. was very staff intensive and highly compressed. The original time of nine months would have been helpful. However, in spite of the extremely short time frames, the study was successfully completed.
- In response to a question, Michigan indicated it was reasonably confident in the information on employer training collected. It was similar to the reading obtained in the focus groups. The interest was in obtaining a “ballpark” indication of training needs and not in precision of the response.

- The cost of the Michigan survey was in the \$200,000 neighborhood, less design and layout cost for the report done by a third party.
- See Figures 2 and 3 for response rates and overall results.

### *Minnesota*

- Minnesota pulled a sample of 2000 firms from the QCEW, excluding retail and accommodations, over sampled manufacturing (to respond to the closedown of a Ford plant), and stratified by 2 digit NAICS to MSA's.
- It was difficult to keep the survey simple; 3-4 months of discussions and vetting were required.
- Minnesota sent a first mailing, a second mailing, and then conducted phone calls.
- Originally Minnesota planned to use JVS survey staff that are very experienced doing two JVS surveys a year, but the staff was assigned to other priority activities. Less experienced staff were involved. Overall Minnesota felt that not enough supporting materials were provided to help respondents in making their judgments and the response rate was only 12%.
- Generally Minnesota indicated they would tighten up definitions, provide more background to respondents, obtain more funding (only \$30,000 was available), and add letters and supporting materials to a package.
- Greater use of the JVS survey approach would be likely if any future survey is undertaken.

### *Oregon*

- Oregon began by clearly defining jobs as the unit of analysis; this included filled and unfilled jobs in theory, though it is unclear whether respondents counted vacant positions. The purpose of the survey was to estimate green jobs, get information on job duties, and acquire wage data for the jobs, along with educational and any special licensing or certification requirements. Respondents also were asked to estimate expected number of jobs in green areas in 2010.
- The sample design involved 11 super sectors that ultimately became 15 groups. The QCEW was used to include businesses with at least two employees in the second quarter of 2008. Two sample groups were selected. One, with 89 employers that were believed to have green employment, was selected with certainty. The other group was randomly sampled by industry and size. (See Figure 1 for additional information.)
- The survey procedures included mail, fax, phone, and online tool entry. Some logic checks were included in the online and data entry tools. The survey was sent with no advance notice. A follow-up mailing occurred one month later. Phone follow-up occurred one month after the second mailing and continued for two weeks. Regional LMI staff helped the survey group make the phone calls. The additional calls were necessary to get the response rate up to the planned 45%. See Figures 2 and 3 for additional information on response rates and results.
- A weighted estimation by firm size and industry similar to CES was used.
- The auto-coder was not used to code jobs into the SOC taxonomy; rather, two OES staff members did all of the coding.

- Oregon felt the wage data collection was successful, with wages slightly higher than the OES wages. Though as they noted, the data are not strictly comparable. It is possible but uncertain whether the use of wide wage ranges in the survey resulted in a higher average wage.
- The one-page inclusion in the package of examples of what to include and what to exclude as green worked well.
- One interesting issue arose—questions on what was meant by jobs were raised in construction and a few other sectors. There was some interpretation that in construction, “jobs” meant a project. Staff clarified this issue.
- There was significant discussion at the work session on the counting of jobs including vacancies versus jobs that were filled, i.e., employment. As noted above, it is unclear whether respondents distinguished between these in the response. [Editorial comment – the survey form does specify green workers in the wage collection portion of the form; it would not be surprising if most respondents included current workers. This would make the Oregon data comparable to the other surveys in the sense that the numbers likely reflect employed persons.]

### *California*

- California redirected the efforts of staff working on another project to implement the survey because of the growing interest in green jobs and green business activity and practices.
- The purpose of the California survey is to develop an estimate of green jobs, identify changing green business practices of producers and users, identify emerging or evolving occupations, and uncover resources and strategies to help businesses reduce their costs and carbon footprint.
- As of July 16, 2009, 49,000 packages had been mailed. (See Figure 1 for the survey design background.)
- Online responses are being encouraged. The California online system, which uses Dimensions software, allows users to save partial responses and to return and complete the response. Responses can also be faxed or mailed back.
- California currently is following up with non-respondents to the first mailing using in-house survey personnel and staff contracted from another state agency. One technique is to try to get the respondent to open the on-line survey on the web page while on the phone.
- California noted that the survey probably requires more than one person to complete the survey, at least in medium to large size establishments.
- California pre-tested the survey with the California Centers of Excellence, a research group within the California Community Colleges, and as a result of the pre-test, developed a page of guidance to include in the mail-out package.
- The mail-out package included a letter from the Governor.
- California noted that some survey responses include critical marginal notations and this is probably a sign of the times given the economic situation. This does not appear to be a major problem in the responses. However, if response rates are lower than hoped for, it is an interesting observation that might bear further study.
- In the survey design, California made sure that each industry had at least one establishment. This raised the planned survey from 50,000 to 51,000. California did extensive address refinement. 6500 businesses with employment of 250 or more were sampled with certainty. (See Figure 1 for additional information.)

- California recognized that the length and complexity of the survey is a challenge to meeting the 50% response rate goal, but felt that it is important to gather such information on green business practices and needs and occupational detail. Therefore, it was worth the effort and risk.
- For more detail on the California survey instrument see: <http://www.labormarketinfo.edd.ca.gov/article.asp?articleid=1250>. Links to the instructions and the sample survey forms are available at the bottom of the web page.

## **Section 6: Analytical Approaches and Use of LMI Resources**

Existing LMI resources provide powerful tools and data to analyze green economic activity, even without survey information. Connecticut and New York discussed their analytical approaches, which do not benefit from any green jobs survey data. Michigan provides a case study in which a state planned from the beginning to use several methods to study green jobs and the greening economy. The Michigan survey questionnaire was specifically designed with existent LMI in mind to keep the survey brief and focused, using LMI to fill in the gaps. As might be expected the OES program and the industry-occupational matrices are key resources in the analyses that each state undertook.

### ***Connecticut***

Connecticut undertook a rudimentary approach to quantify estimates of green jobs to explore how existing LMI can provide some insights to the greening economy. Dr. Nicholas Jolly described three approaches in a brief article in the December 2008 issue of *The Connecticut Economic Digest*.

- The first approach identifies selected green-related occupations using the SOC definitions and looks at employment for those occupations between 2006 and 2016. While this method understates green-related employment it suggests the potential of using a fairly simple approach to get a sense of some green employment and projected trends.
- The second method identifies green-related industries, using the NAICS manual and the QCEW and examines 2007 employment and wages in those industries. These estimates, while four times as large as the first method, still are likely to understate green-related employment.
- The third method combines occupational and industry data using an approach similar to a method to estimate high technology employment in an article by Daniel Hecker in “High-technology Employment: a NAICS-based Update,” *Monthly Labor Review*, July 2005.

While none of these methods offer a complete picture they do begin to provide information that could be used to identify occupations and industries for further analysis in terms of education and training requirements. The data also serve as a starting point for exploring industries and occupations that might be impacted by private and public investments into environmentally friendly initiatives. The occupational approach is probably the most useful of the three, when combined with other occupational information from other LMI sources, for informing workforce development investments. Connecticut provided requesters with a list of green occupations drawn from published reports, along with their associated employment levels, projected growth,

wages, license requirements, education and training requirements, and resources to identify the organizations and programs that provide instruction related to the green occupations.

### *New York*

New York's study was prepared in response to the First Report of the Renewable Energy Task Force to then Lieutenant Governor Patterson. The state established three objectives of public investment in clean energy investments: stimulate job creation and retention, support workforce development of workers, and advance pathways out of poverty. These mandates drove the New York study on clean energy jobs with a focus on 6 energy sectors including solar manufacturing, solar installation, wind turbine manufacturing, wind turbine installation, weatherization, and energy service companies. The NY study is available at:

<http://www.labor.state.ny.us/workforcenypartners/PDFs/NYS%20Clean%20Energy%20Jobs%20Report%20FINAL%2005-27-09.pdf>

The New York study includes elements described below.

- A decision made to narrow the scope to industry and occupation: solar, wind, renewable fuels, energy efficiency, and weatherization
- The study relied heavily on the NAICS and SOC definitions.
- New York identified green-related businesses using a wide range of sources including the Web. NAICS codes were assigned to the businesses and labor market characteristics were identified for each of the sectors. This was very labor intensive.
- New York used QCEW data for 2002 – 2007 to look at trends.
- The New York study included some social aspects of green collar jobs, consistent with the goals of the state. However, this did not limit the analysis. New York first identified industries and occupations and subsequently looked at wage data and employment trends to identify more promising job opportunities – this occurred at the stage of identifying job and training resources.
- New York noted that this is an ongoing process and did not cut-off occupations due to wages. For example, weatherization was identified as a potential source of employment for youth with relatively little training to help pull them out of poverty.
- Identified 2,500 NY businesses; out of these 250 firms identified in as clean energy related and distributed as follows:
  - 35% installers
  - 23% distributors
  - 21% manufacturers
  - 15% energy services
- The relatively few firms identified as green surprised New York, as did the large number in construction – though in retrospect the latter makes sense.
- NY used the staffing patterns for the industry applied to the firms
- NY plans to do a survey in the future and would include a broader set of industries than in the current study.

## *Michigan*

Michigan, as noted, used a survey, traditional LMI, and focus groups as the primary resources for its report. The report intentionally separates presentation of survey data, industry trends analysis, occupational trends, and a special green-related firm component. Some of the issues considered are listed below.

- Michigan identified green-related industries and occupations using a variety of sources and then used LMI sources to examine employment trends, wages, education and training requirements and career ladders. 118 green-related industries and 105 green-related occupations were identified.
- The industry analysis first assigned the 118 green-related industries into seven clusters. The report used a variety of techniques including location quotients and bubble charts to examine employment trends, employment concentration, competitive employment performance, and industry wages.
- The occupational analysis explored green-related occupations regarding forecast job growth and annual openings, relative wage rates, examples of selected potential career ladders, key skill and knowledge requirements, and educational and training requirements for certain green-related occupations.
- Focus groups filled in some of the information gaps including what skill needs exist and what are some of the training needs. Focus groups were convened for Agriculture and food systems, Environmental resource management, Green construction, Recycling, Solar power, and Wind power.
- Seven clusters were used to analyze the industries but the cluster approach did not work for the occupations. The clusters included the five core areas used in the survey and added a Miscellaneous green manufacturing cluster and Engineering, testing, and consulting services cluster.
- Manufacturers can make parts with applications throughout the green economy. This makes it difficult to assign these sectors to a single cluster. Michigan created a separate Miscellaneous green manufacturing cluster for this reason
- If Michigan repeats the survey, they will analyze whether their industry and occupational lists match to the survey green occupations and industries
- One issue complicating an industry analysis is that NAICS groups by primary activities while green activities may be a secondary or even tertiary activity.
- Michigan did not analyze industry-staffing patterns in this report choosing to keep the industry and occupational analyses separate. Future work may examine staffing patterns.
- Michigan used another technique to complement the analysis, studying 358 firms that they identified as green using information from associations, web sites and other sources. QCEW data on the 358 green-related firms showed a job growth rate of 7.7 percent from 2005-2008. Total Michigan jobs during this period fell by 5.4%. This was not intended as a statistically valid sample, but simply to provide greater insight into green-related employment trends in Michigan.
- This section of the report received much attention because it provided some clues, but no direct evidence, that green job growth may have occurred in Michigan. The text clearly stated that this section of the report was based on just a small sample of firms known to

be green-related, but that the sample of firms may not be representative of the entire green economy.

- MI took an exclusive approach in identifying the firms – if it could not confirm through web research that a firm produced green products or services, the company was dropped from the analysis.
- Michigan attempted to track liability dates and predecessor/successor relationships to confirm that many of the identified green-related firms were newly established since 2005. This allowed the report to raise the possibility that entrepreneurs may be a factor in the green sector.
- If Michigan undertakes future studies, they would:
  - Try to build in more time for the study.
  - Possibly integrate survey results with LMI in the analysis – for example looking at OES wages for occupations that included a significant number of green jobs.
  - Seek a more efficient way to search the QCEW to find green-related firms.
- BLS noted that it might be useful to look at whether more can be done on enterprise linkages, such as cases in which there are different EIN's for a single company.

## **Section 7: Use of Other Resources and Brainstorming**

Several items were discussed in a brief session on other resources.

- BLS indicated it might be of use to explore partnerships with organizations such as PEW and Collaborative Economics and other interested parties that may have databases of interest to BLS and State LMI units.
- Some concern was expressed about analytical approaches that move away from the job as the unit of observation.
- Connecticut indicated that the use of analytical techniques might depend on what you want to do. For example it may be possible to use analytical methods to effectively direct the use of stimulus funds or other investments without measuring green jobs. However if the need is to measure the extent of the greening of the economy and estimating green jobs, a survey is probably the only reasonable method.
- Keeping up to date on key regulations and funding sources may be important, since policy is a key driver of green economic activities.
- There is a need to understand the link between the manufacturer and the environmentally friendly companies that become the consumers and how you do clean up. For example it may be useful to review some studies of European Eco-Industrial Parks that are being considered as possible models in Los Angeles.
- None of the participants had used any econometric models, but some noted they have used information from studies using models on biomass and wind power. There have been a number of studies in response to legislation on carbon reduction that use models including some that estimate the impact on employment.
- In its projections program, BLS uses the BEA input/output model that has 430 detailed industries; Washington has a model with about 300 industries.
- O\*NET is useful for immediate use in the training system but it was not clear how the O\*NET categorizations of green occupations might answer some of the immediate needs of the stimulus package.

- Using focus groups might provide value to future studies:
  - Help identify the interests of stakeholders to focus data collection
  - Employer focus groups help develop an understanding of the employer's perspective
  - Michigan said the focus groups were invaluable – it is important to ask open-ended questions to let employers tell you what they need, what their interests are. For example, Michigan was advised that the welding skills required for large-scale wind turbines were more like those of bridge builders than the welding done on automobiles.
  - Generally focus groups can be used to vet survey instruments, obtain qualitative information, and gain different insights and perspectives on the greening economy.
  - It is important to keep in mind that the focus group represents only those in the room and is not necessarily representative of a larger population.
  - Focus groups can be useful for pretests and follow-up.

## Endnotes

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<sup>i</sup> The discussion of definitions of green jobs often included detailed references to subsequent survey and /or analysis. These points are left as part of the definition discussion rather than moving them to other sections, because they are so deeply entwined and provide the same context for the reader as for the work session participants.

<sup>ii</sup> If the reader wishes to track through a specific state's comments, locate the state discussion in Sections 3-5 and read each of those in sequence.

<sup>iii</sup> For more information see: [http://www.psychologie.uzh.ch/sowi/reips/ijis/ijis2\\_1/ijis2\\_1\\_shih.pdf](http://www.psychologie.uzh.ch/sowi/reips/ijis/ijis2_1/ijis2_1_shih.pdf) and [http://www.rti.org/pubs/aapor09\\_mcfarlane\\_paper.pdf](http://www.rti.org/pubs/aapor09_mcfarlane_paper.pdf)

<sup>iv</sup> Each state uses a different name for similar categories. Generally this report refers to these as green economic activity categories.

<sup>v</sup> The group worked in a forum through the National Association of State Workforce Agencies

<sup>vi</sup> National Association of State Workforce Agencies