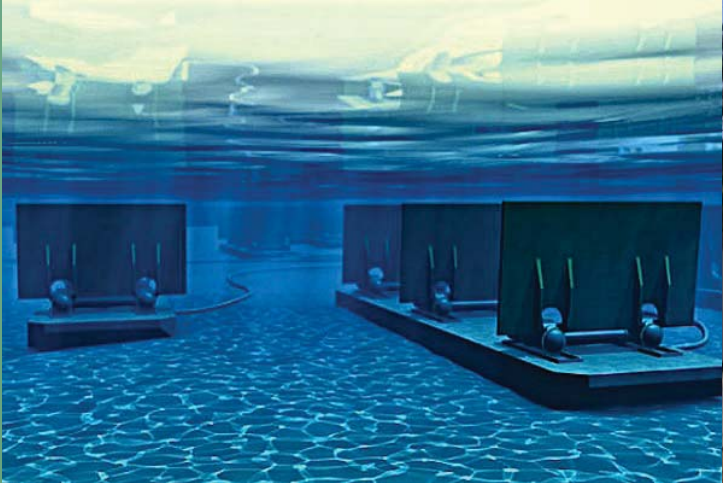


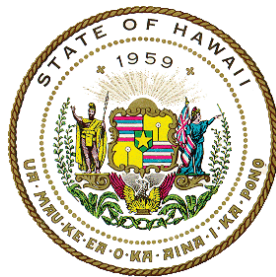


Updating the Baseline: Hawai‘i’s Clean Energy Jobs

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Hawai‘i Energy Policy Forum
College of Social Sciences
University of Hawai‘i - Mānoa



State of Hawai‘i
DAVID Y. IGE, GOVERNOR

Commissioned by the
Hawai‘i Energy Policy Forum

Prepared by the

Department of Labor and Industrial Relations
Linda Chu Takayama, Director
Leonard Hoshijo, Deputy Director

Research and Statistics Office
Phyllis Dayao, Chief
John Kontos, Lead Researcher

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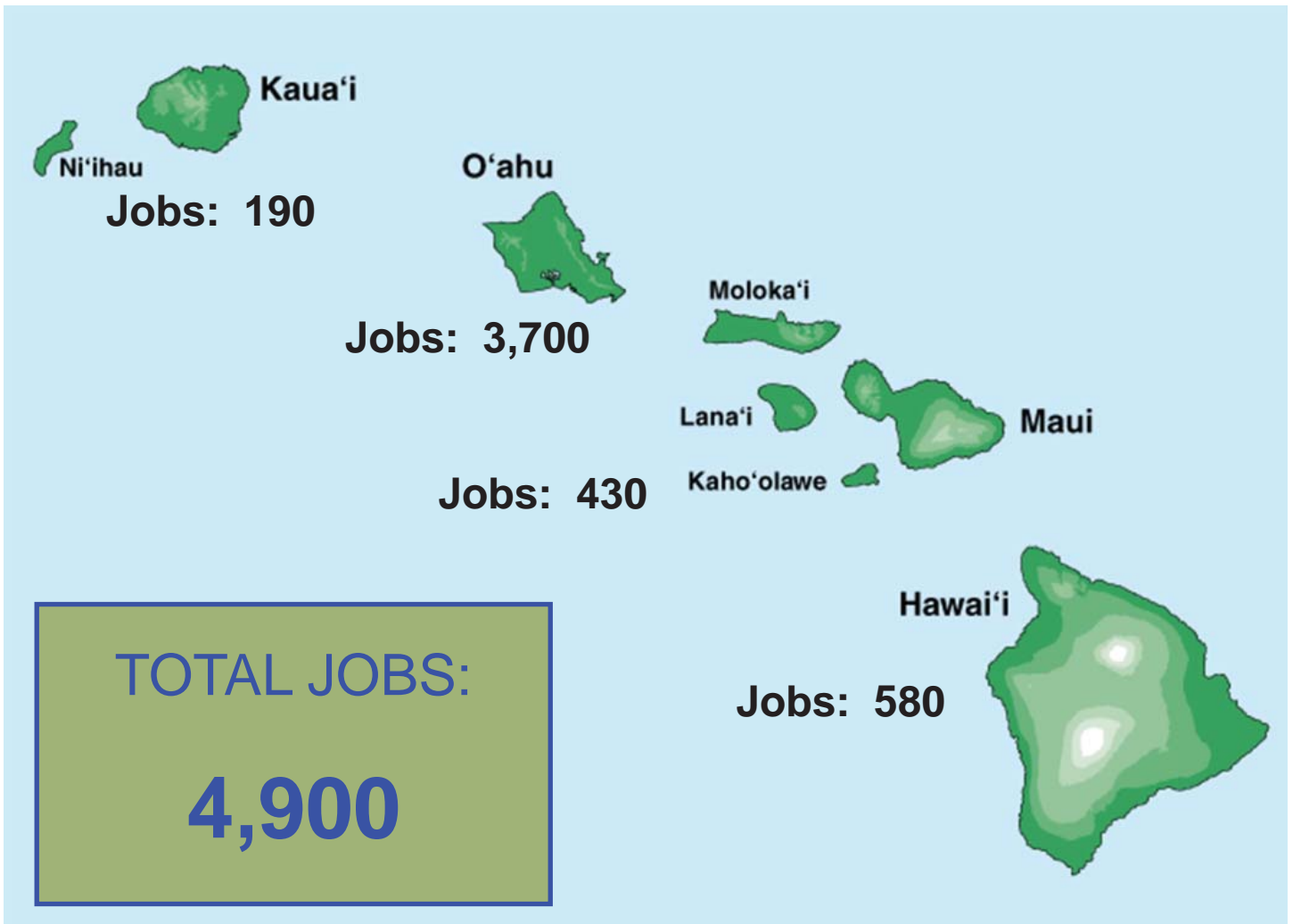


Figure 1. Total Number of Jobs in Clean Energy and Energy Efficiency

Executive Summary

This report provides an estimate of the number of jobs in the state of Hawai‘i in two core areas: 1) jobs that generate renewable energy; and 2) jobs that contribute to energy efficiency.

The estimates presented in the report are based on a survey of Hawai‘i’s businesses, which took place from March to May 2015. A total of 664 businesses responded to the survey. The report aims to update the information regarding jobs in the two core areas presented by the Hawai‘i Green Jobs Initiative’s 2010 publication, *Hawai‘i’s Green Workforce: A Baseline Assessment*.

Key findings include:

- **A total of 4,900 energy-related jobs were estimated in Hawai‘i’s private sector as of May 2015 (Fig. 1). About two-thirds or 3,220 of those jobs were in the Energy Efficiency core area, while more than one-third or 1,680 were in the Generate Clean Energy core area.** The industries with the most jobs in the two core areas were:
 - Construction
 - Professional, Scientific, and Technical Services
 - Utilities
 - Wholesale Trade

The top occupations were

- Solar Photovoltaic Installers
 - Plumbers, Pipefitters, and Steamfitters
 - Electricians
 - Mechanical and Other Engineers
 - Retail Salespersons
 - General and Operations Managers
 - Solar Thermal Installers and Technicians
 - Wholesale and Manufacturing Sales Representatives
- **According to employers, the expected growth in jobs in the two core areas by 2017 was 7.3%, which would lead to the creation of an additional 350 jobs in the next two years.**
 - **Honolulu County (the island of O‘ahu) had 3,700 jobs, Hawai‘i County had 580 jobs, Maui County (which includes the islands of Maui, Moloka‘i and Lāna‘i) had 430 jobs and Kaula County had 190 jobs.** One major difference in the job markets of O‘ahu and the other three counties was that while there were more jobs in the Energy Efficiency core area on O‘ahu, there were more jobs in the Generate Clean Energy core area in the other three counties.
 - **The vast majority of Construction jobs could be found in the Plumbing, Heating, and Air-Conditioning Contractors subgroup, and to a lesser extent in the Electrical Contractors and Other Wiring Installation Contractors subgroup.** The situation is similar in the other top industries, with one or two subgroups dominating the number of jobs.

Introduction

In December 2009, the Research and Statistics Office (R&S) of the Hawai‘i Department of Labor and Industrial Relations (DLIR) launched the Hawai‘i Green Jobs Initiative (HGJI), a project whose goal was to generate baseline employment estimates and projections, in order to provide useful information to jobseekers, educational institutions, training providers and other decision-makers with an interest in environment-friendly work and practices. In December 2010, *Hawai‘i’s Green Workforce: A Baseline Assessment*, was published. It included the first comprehensive study of Hawai‘i’s Green economy as well as green jobs projections for the state.

While the HGJI provided definitions and a comprehensive framework regarding green jobs, it also highlighted the need to update information and projections for green jobs on a periodic basis. With the exception of *Reality Check: How Green is Hawai‘i’s Workforce?*¹ (which was done without input from employers), there had been no available resources to conduct another survey in order to measure the number of green jobs in the state, so the need for a follow up study to provide an updated picture of Hawai‘i’s green job market had become more urgent.

The Hawai‘i Energy Policy Forum (HEPF), an organization whose mission is to achieve a clean and sustainable energy future for Hawai‘i, was responsible for a multiphase project to develop meaningful metrics in order to measure Hawai‘i’s progress towards its clean energy goals. One of the main components of the project was the assessment of the green job market and the collection of up-to-date information regarding green jobs. The need for up-to-date information regarding green jobs led to HEPF contracting R&S in the Fall of 2014 to conduct a follow-up survey and provide a report on the status of green jobs in the state.

For the purposes of this study, it was determined that the focus would be on two of the five green core areas identified in the 2010 Baseline Assessment:

1) Jobs that Generate Clean, Renewable, Sustainable Energy

These are jobs that generate clean, renewable, sustainable energy produce, transmit or store clean, renewable energy from solar, wind, hydro, geothermal, ocean, biomass or other renewable resources. Clean energy must have a positive net energy yield, relatively reduce greenhouse gas emissions, and be produced and distributed in a sustainable and safe manner.

2) Jobs that contribute to Energy Efficiency

Jobs that contribute to energy efficiency reduce the amount of energy used to produce a unit of output and include producing or installing, energy-efficiency products, providing energy-efficiency services, and improving energy efficiency of buildings and transportation methods.

This report provides employment estimates and projections derived from the survey responses of employers in these two core areas. It is important to note that users of the information contained within this report should understand the methodology used, assumptions made in developing the estimates based on the survey responses, and the limitations of the data.

1 https://greenjobshawaii.hirenethawaii.com/admin/gsipub/htmlarea/uploads/RealityCheck_How_Green_is_Hawaiis_Workforce.pdf

Methodology

The following is a summary of the process used to produce the estimates of clean energy and energy efficiency jobs in Hawaii contained in this report:

The initial plan for this project was to survey 2,500 businesses, but due to a lack of personnel, the number of businesses that were eventually contacted was limited to 1,250. In order to ensure that the sample of employers chosen would provide accurate and useful information, the number of businesses chosen from each industry sector varied depending on whether the industry had been identified as an industry with a significant number of clean energy and energy-efficiency jobs by the 2010 Baseline Assessment. For the 2010 survey, the sample of worksites was drawn from the Quarterly Census of Employment and Wages (QCEW) database, which contains data on private employers in Hawai‘i that report to the State’s Unemployment Insurance Division. This was not an option for this survey so businesses were selected from other databases including the Hawai‘i Green Employers Directory², Hawai‘i Energy lists of participating contractors and clean energy allies³, the Hawai‘i Solar Energy Association (HSEA) member list⁴, and the Hawai‘i State Energy Office’s list of renewable energy projects throughout the state⁵. The list was completed with businesses found in the Analyst Resource Center’s (ARC) Employer Database⁶. For the purposes of continuity, an attempt was made to contact as many of the employers that responded to the 2010 Green Jobs Survey. At the same time, due to the smaller sample compared to 2010, it was necessary to target employers with a higher chance of having jobs in the two core areas. There was a focus on businesses operating in renewable energy industries other than solar (wind, biomass, etc.) for which there is less information available. Finally, the distribution of businesses by



Act 97 signed into law by the Governor in 2015, set the State’s renewable portfolio standards at 100%. Hawai‘i is the first state in the country to set such an ambitious target, though officials say achieving it will require considerable effort.

county was taken into account in order to select a sample that was truly representative of Hawai‘i’s business sector.

One of the main problems faced by the project was that in many cases the contact information available, especially of companies found in the ARC Employer Database proved to be outdated. Some of the companies contacted had either closed or moved to a different location and it was not always possible to find accurate contact information. A total of 196 of the businesses initially contacted had either closed or could not be reached.

The Survey Questionnaire

The survey questionnaire (See Appendix D) was created with the purpose of answering the most pressing questions regarding clean energy and energy efficiency jobs in the State. The experience of conducting the 2010 Green Jobs Survey, as well as information provided by similar projects in other states, proved extremely valuable in building a questionnaire that asked the most important questions without becoming too time-consuming for the respondents. In comparison to the 2010 survey questionnaire, questions regarding green practices were removed, as were questions regarding qualifications and training requirements.

2 <https://lmi.ehawaii.gov/green/welcome.html>

3 <https://hawaiienergy.com/>

4 <http://www.hsea.org/membership/members>

5 <http://energy.hawaii.gov/>

6 For more information on ARC, see <http://www.workforceinfodb.org/>

It would have been useful to get more information on the training, education and work experience required for jobs in demand, but a review of the responses of the 2010 Green Jobs Survey revealed that it was often time-consuming as well as difficult for the respondents to answer this question accurately. Such questions were thus omitted in order not to lower the response rate. These types of information are also available in various U.S. Labor Department publications as well as websites⁷.

Employers were asked to provide some information about their company and if their business had jobs related to clean energy. If they responded positively, they were subsequently asked to provide a list of the job titles, a brief description of each position, the core area in which the position belonged, the number of employees in the position, the number of vacancies, and the expected number of workers in 2017. In some cases, it was difficult for employers to choose a core area or to make an accurate 2017 prediction, necessitating follow-up calls to get the best possible response. If a business was entirely dedicated to one of these two core areas, then all positions in the company were considered clean energy/energy efficiency jobs.

Survey Response

The survey was mailed to a total of 1,250 businesses, who also had the option of responding to an online survey. Survey forms that were returned by the Post Office due to incorrect addresses were researched and re-sent. Employers were given one month to respond. Most employers chose to respond by mail, but a significant number responded to the online survey. Follow-up phone calls were made to all businesses that had not responded by the deadline in order to ask them if they received the survey and whether they would like them re-sent. There were two subsequent mail-outs. After each mail-out, phone calls were made to encourage employer participation. This led to a total of 664 responses, 333 by mail, 201 to the online survey, and 115 via other means (phone, email, etc.). Fifteen (15) employers refused to participate and 196



Kaheawa Wind Power, Maui
Source: Wikipedia, Tom Walsh

could not be contacted. Useable responses from the 1,250 on the initial list resulted in a response rate of 53 percent.

Data Analysis

While it was not possible to contact the same number of companies that were contacted in 2010, the experience of the 2010 survey and the fact that only two core areas were targeted, made it possible to create a sample, that while smaller, would provide us with an adequate number of responses in order to have a clear picture of where the industry was standing in terms of jobs. This was done to understand how the number of jobs changed within each NAICS code, on each island, and in each core area, as well as how the total number of jobs had changed.

Since only two core areas (jobs in Clean Energy and Energy Efficiency) were of interest to the project, and only 1,250 businesses would be included in the sample, an effort was made to contact businesses that were more likely to respond and have jobs in both of the two core areas. At the same time, efforts were made to learn more about industries for which less information was available, but there were strong indications that they had a significant number of energy-related jobs. For example, small businesses that generated renewable energy other than solar, but were sometimes hard to locate since there are no state-wide organizations or business associations which

⁷ <http://www.onetonline.org/>

could provide information about them, as there were for businesses that operated in the solar industry.

To accomplish this, as mentioned above, lists of businesses from Hawai'i Energy, the Hawai'i Solar Energy Association (HSEA), the Kaua'i Island Utility Cooperative (KIUC), and the Hawai'i Directory of Green Employers⁸ were used. The final list was completed with businesses from the Analyst Resource Center (ARC) Employer Database, with an emphasis on businesses that, based on their business activities, were likely to have jobs in the two core areas. At the same time it was very important to ensure that all four counties were adequately represented in the sample. One of the major obstacles faced by the project was the lack of information regarding worksite size based on the number of employees. Also, some of the businesses contacted had out-of-date contact information, and while major efforts were made to reach out to as many as possible, we were not always successful, either because they had closed or for other reasons. This meant that the sample was smaller than what was initially intended.

Estimating the number of jobs was based on a direct comparison of the responses to the 2015 survey to the responses from the 2010 Hawai'i Green Jobs survey. This was done to understand how the number of jobs changed within each NAICS code, on each island, and in each core area, as well as how the total number of jobs had changed. For more information on the results of this direct comparison, see Appendix A. Job estimations were only made when there were an adequate number of responses. The comparison revealed a significant increase in the number of clean energy and energy efficient jobs among the employers that responded. The percentage increases from the responses to the 2010 survey gave us our initial estimates, but the responses were reviewed one-by-one in some cases, to ensure that no outliers were skewing the results.

Due to the small number of responses for some of the subgroups by county, industry and occupation, the focus was on estimating the total number of jobs in the two core areas, and then based on those numbers, estimating the number of jobs in each subgroup. Since the sample was not random, but was selected



*An image of MicroCSP collectors on the Big Island of Hawai'i.
Source: Wikipedia*

with the intention to target businesses more likely to respond and to have jobs in the two core areas, a number of different parameters were taken into account when analyzing the results. Such parameters were the volume of responses for each subgroup (such as industry, occupation group or county) for which a job estimate was made, the average number of jobs in the two core areas in every subgroup, as well as the total number of jobs in each subgroup according to the latest employment census⁹ in the state and the 2010 *Baseline Assessment*. In some cases, as with the estimation of the number of jobs by occupation, the responses were cross-examined with responses to other surveys conducted by the Research & Statistics Office, and compared to previous estimates to ensure that no outliers led to inaccurate estimations.

The job estimates in almost all cases were rounded to multiples of ten.

The survey instrument used for this project can be found in Appendix D.

⁸ The Hawai'i Directory of Green Employers was created based on the responses to the 2010 Hawai'i Green Jobs Survey.

⁹ <https://www.hiwi.org/gsipub/index.asp?docid=420>

Estimating Clean Energy Jobs

Current Jobs

The responses given by employers in 2015 indicate that there has been a significant increase in the number of clean energy and energy efficiency-related jobs since 2010 as seen in Tables 1, 2, and 3. These tables do not present the raw data provided by the survey respondents, but the estimates of the total number of jobs in the state of Hawai‘i that were calculated based on the raw data. (see the Methodology section for more information on how the numbers of jobs were estimated). There were an estimated 4,900 jobs in the two core areas (Clean Energy and Energy Efficiency),

which indicates a significant increase since 2010 when the estimated number of jobs was 3,816 (2,552 in the Energy Efficiency core area and 1,264 in the Clean Energy core area). Approximately two-thirds of the jobs were in the Energy Efficiency Core Area and one-third in Clean Energy, which is consistent with the results from 2010. The table below shows the estimated number of jobs by county and core area. The decrease in the number of energy efficiency jobs in Maui was most likely due to the overestimation of jobs in this core area in Maui in 2010.

Table 1. Number of Jobs by Core Area and County

Jobs by Core Area and County						
	Generate Clean Energy		Energy Efficiency		Total	
	2010	2015	2010	2015	2010	2015
Honolulu County	806	900	1,677	2,800	2,483	3,700
Hawai‘i County	265	390	215	190	480	580
Maui County	129	250	620	180	749	430
Kaua‘i County	64	140	40	50	104	190
Total	1,264	1,680	2,552	3,220	3,816	4,900

Table 2. Construction; Professional, Scientific, and Technical Services; Utilities and Wholesale Trade are the industries with the most Clean Energy and Energy Efficiency jobs.

Industries with the most Jobs and largest subgroups within each Industry	
	Total Jobs
Construction	2,400
<i>Plumbing, Heating, and Air-Conditioning Contractors</i>	1,670
<i>Electrical Contractors and Other Wiring Installation Contractors</i>	420
Professional, Scientific, and Technical Services	800
<i>Architectural, Engineering, and Related Services</i>	400
Utilities	770
<i>Electric Power Generation, Transmission and Distribution</i>	540
Wholesale Trade	500
<i>Hardware, and Plumbing and Heating Equipment and Supplies Merchant Wholesalers</i>	330
Others	430
TOTAL	4,900

Notes:

- Plumbing, Heating, and Air-Conditioning Contractors as well as Electrical Contractors and Other Wiring Installation Contractors are industry subsectors at the 6-digit NAICS level.
- Building Equipment Contractors is at the 4-digit level, which includes the above two 6-digit codes.
- The Construction Industry includes Specialty Trade Contractors such as Building Equipment Contractors (which includes Plumbing and Electrical Contractors), as well as businesses involved in the Construction of Buildings and Heavy and Civil Engineering Construction. The vast majority of the Construction jobs, as seen in Table 2, can be found in the Plumbing, Heating, and Air-Conditioning Contractors and Electrical and Other Wiring Installation Contractors subgroups.
- Architectural, Engineering, and Related Services, Electric Power Generation, Transmission and Distribution and Hardware, and Plumbing and Heating Equipment and Supplies Merchant Wholesalers are industry subsectors at the 4-digit NAICS level.
- The Utilities industry includes Electric Power Generation, Transmission and Distribution companies and companies involved in Water, Sewage and Other Systems and Natural Gas Distribution. Electric Power Generation companies include companies involved in Solar, Wind, Geothermal, Biomass and other forms of Electric Power Generation.
- For more information on how jobs are classified by industry, see Appendix B: “What is NAICS?”

Jobs by Industry

Using the North American Industry Classification System (NAICS), the industry with the most clean energy jobs was Construction¹⁰ where 2,400 or almost 50 percent of the total number of jobs could be found (see Table 2). The Construction sub-groups with the most jobs were Plumbing, Heating, and Air-Conditioning Contractors, which comprised approximately two-thirds of all clean energy-related Construction jobs with an estimated 1,670 jobs, and Electrical Contractors and Other Wiring Installation Contractors which followed with approximately 420 jobs. Plumbing, Heating, and Air Conditioning Contractors as well as Electrical and Other Wiring Installation Contractors are categorized as Building

Equipment Contractors, a sub-group where the vast majority of construction jobs were found.

The second largest industry sector in terms of clean energy and energy efficiency jobs was Professional, Scientific, and Technical Services with an estimated 800 jobs. The industry subsector in Professional, Scientific, and Technical Services with the most clean energy and energy efficiency jobs was Architectural, Engineering, and Related Services.

The next two largest industry sectors in terms of energy-related jobs were Utilities (with Electric Power Generation, Transmission and Distribution being the dominant subsector) and Wholesale Trade (with Hardware, and Plumbing and Heating Equipment and Supplies Merchant Wholesalers) being the subsector with the most jobs.

¹⁰ The North American Industry Classification System (NAICS) was used to classify jobs by industry.

Location of Jobs

The vast majority of jobs were on the island of O‘ahu (Honolulu County) with a total of 3,700 out of 4,900 jobs (Fig. 2). Hawai‘i County (Big Island) had 580 jobs, 430 jobs were in Maui County and 190 jobs were on Kaua‘i. The number of clean energy-related jobs on O‘ahu as a proportion of the total number of clean energy-related jobs in the state has increased from approximately 65 percent to 75 percent.

It should be noted that some large businesses with headquarters on O‘ahu may have had employees on the neighbor islands, but it was not possible to know if that was the case, based on the responses received. One major difference between O‘ahu and the other islands was that while O‘ahu had more jobs in the Energy Efficiency core area with 2,800 and much fewer jobs in the Clean Energy core area with 900, the opposite was true for the other three counties. This was also the case in 2010, but it seems that the differences in the energy job market on O‘ahu and the neighbor islands have become even bigger lately. One explanation for this was that there was a “floor” of required jobs in each county in the Clean Energy core area and the difficulties in commuting from island to island were most likely contributing factors, but O‘ahu has more jobs in the Energy Efficiency core area most probably due to its larger population.

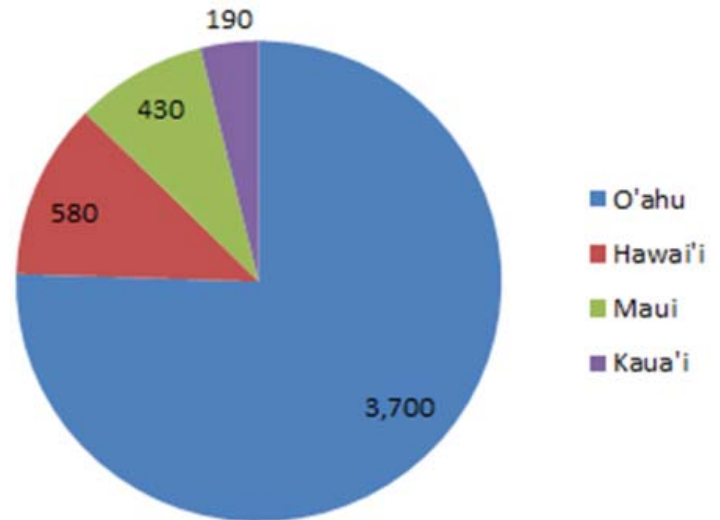


Figure 2. Total number of Clean Energy and Energy Efficiency Jobs in each county



Solar Panels on the roof of the Kapiolani Medical Center parking garage on the island of O‘ahu. While the number of jobs in Clean Energy and Energy Efficiency has increased on all islands, O‘ahu now has 75% of the state’s jobs in these two core areas. Image source: Earthjustice.org

Table 3. The top occupations in the two core areas by number of jobs.

Top Occupations	
Solar Photovoltaic Installers	580
Plumbers, Pipefitters, and Steamfitters	430
Electricians	300
Mechanical Engineers	200
Engineers, All Others*	180
Retail Salespersons	160
General and Operations Managers	120
Heating and Air Conditioning Mechanics and Installers	120
Solar Thermal Installers and Technicians	120
Sales Representatives, Wholesale and Manufacturing**	120

*The occupation category Engineers, All Others includes Energy and Solar Energy Systems Engineers among others. There is also a significant number of Electrical, Environmental and other Engineers not listed here.

**Does not include Sales Representatives of Technical and Scientific Products.

The Standard Occupational Classification (SOC) system was used to classify jobs listed by employers. The 2010 SOC system is used by Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. For more information on how jobs are classified by occupation, see Appendix C: “What is SOC?”

Top Occupations

There were a wide array of positions in the two core areas studied in this project. The top occupation¹¹ was Solar Photovoltaic Installers. There has been a significant increase in the number of Solar Photovoltaic Installers from 237 in 2010 to 580 in 2015, which results in a 144 percent increase. The other top occupations were:

- Plumbers, Pipefitters, and Steamfitters
- Electricians
- Mechanical Engineers
- Energy and Solar Energy Systems Engineers
- Retail Salespersons
- General and Operations Managers
- Heating, Air Conditioning, and Refrigeration Mechanics and Installers
- Solar Thermal Installers and Technicians
- Wholesale and Manufacturing Sales Representatives, Except Technical and Scientific Products

Note that if a business engaged mainly in green activities, then all positions were considered green but not all employers who responded to the survey may have been aware of this definition of green jobs and reported only positions that were directly involved in their company’s energy-related activities. Therefore, support staff may not have been included. This could have resulted in an underestimation of the number of jobs not directly involved in producing clean energy or increasing energy efficiency, but nonetheless playing an important role in their company’s performance and growth. While not listed here, there was also a significant number of Chief Executives, mostly at small businesses and start-ups, which indicated that there was room in this industry for small or new businesses to prosper.

One of the questions employers were asked was how many vacant positions their businesses had. Based on the responses received, there were an estimated 600 vacancies in the two core areas examined. This is a significant increase in comparison to 2010 when the total number of vacancies in all five core areas was 670. The vast majority of the vacancies were in Honolulu County.

¹¹ The Standard Occupational Classification System (SOC) was used to classify jobs listed by occupation.

Vacancies and 2017 Projections

Employers were also asked about the expected growth in the number of jobs in the two core areas. Based on the responses received, the expected growth was approximately 7.3 percent or an additional 350 positions by 2017. It should be noted that in 2010, employers had overestimated the number of positions they had expected to have in 2012 by a significant amount. This could suggest that employers in some cases may have been overoptimistic with regards to their company's growth. On the other hand, there was a significant number of 2015 respondents that expected their company to shrink, possibly due to some recent developments in Hawai'i's solar industry, where a large number of responding businesses operated, making solar businesses pessimistic about the future.

Again, the majority of the growth is expected to take place in Honolulu County, with smaller increases in Maui County and Kaua'i County, and even smaller increases in Hawai'i County. This is an interesting finding since Hawai'i County had the largest expected growth rate in the two core areas examined in 2010. One explanation for most of the vacancies as well as the expected growth being reported by O'ahu employers was that many of the larger businesses could be found on O'ahu, while in some cases businesses that started on the neighbor islands, relocated to O'ahu as they grew and expanded their operations.



What does the future hold in terms of energy-related jobs for Hawai'i's workforce? The number of jobs is expected to grow by 7.3%, which would lead to the creation of 350 positions by 2017. Image source: State of Hawai'i Department of Labor and Industrial Relations

Recommendations

Examining the renewable energy industry in Hawai‘i five years after the 2010 Hawai‘i Green Jobs Initiative’s first research project, provided us with some interesting information. The increased focus on the detrimental effects of fossil fuels on the environment as well as the state’s economy and its citizens’ finances had led to unforeseen demand for renewable energy and higher public awareness for more energy efficient practices. As a result of these changes, we were presented with a different picture than what we encountered five years ago.

The number of jobs in almost all counties and all industries had increased significantly. The clean energy industry had come to life in the state of Hawai‘i, a development that was apparent not only in the results of this study, but also in national publications, where Hawai‘i was often seen as a pioneer in the field. At the same time, the industry still faced many obstacles. Many of the businesses that responded to our survey pointed out the difficulties their companies were facing, either due to unfair competition, legislation or lack of it, and the role clean energy business organizations have played in the industry’s development. At the same time, there were new companies with innovative ideas that deserved more attention including companies that produce clean energy using biomass, ocean energy, and other renewables.

It is very important for the State to be able to track the progress made in the industry, the problems it faces, and the areas that require assistance and support in order to further develop. The urgency of Hawai‘i’s energy issue was the main motivation for projects such as this one, but more collaboration between state agencies, research organizations, nonprofits, and most importantly, the industry itself is required to continue producing useful results.

Based on R&S’ experiences with both the 2010 Baseline Assessment and this project, a separate survey has been deemed to be the only option to capture information on green jobs and green



The Hawai‘i Directory of Green Employers is a useful tool for Hawai‘i’s employers and job seekers.

URL: lmi.ehawaii.gov/green

employers. Currently, states are not allowed to make modifications to the BLS employer surveys that they conduct. Therefore adding questions to existing surveys distributed to Hawai‘i employers is not an option. We are also unable to derive numbers of green jobs from these surveys which utilize industry and occupational classification systems because they do not differentiate employees whose primary focus falls under one of the green core areas (for example, the BLS employer surveys cannot tell us if an electrician’s main activity is green or not).

It should also be noted that if a business engaged mainly in green activities, then all of its positions were considered green. But not all employers who responded to the survey may have been aware of this definition of green jobs and may have only reported positions that were directly involved in their company’s energy-related activities.

The survey approach requires extensive follow-up with employers to clarify whether they have employees whose primary focus falls under one of the core areas. That question can be difficult to answer, and is likely influenced by changes in technology, markets, perceptions, and other forces. The survey approach also allows targeting of specific industry

sectors with the largest numbers of green jobs. Over time this approach may allow comparisons of and analysis of green jobs information and improve projections estimates.

Another major issue encountered by the project was that for some businesses with a large number of employees involved in clean energy or energy efficiency, responding to the survey and listing all of their jobs in the two core areas proved to be extremely time-consuming. In order to have a clearer picture of the number of jobs, it would be important to motivate such businesses to participate in future studies.

Increasing awareness of the survey and its importance among energy businesses through organizations that are a part of the industry would also increase the response rate. Coordination between all stakeholders involved would produce better results by making everyone more aware of efforts such as this one, whose ultimate goal is to serve the public, the industry itself and the development of Hawai‘i’s workforce.

In addition to what is mentioned above, working with an updated database of clean energy businesses would be ideal. One way to solve this problem would be by conducting the survey on a periodic (annual or bi-annual) basis, in which case the researchers would be able to identify a core of businesses that operate in the industry. The list would be updated every year (or every two years), but the changes would be far smaller than what occurred in the five years between the Baseline Assessment and this project.

The 2010 Baseline provided the first comprehensive assessment of Hawai‘i’s green workforce. This 2015 report provided a snapshot of two core areas. Funding of an ongoing survey and assessment is needed in order to develop better occupational estimations and projections for green jobs across all industries and occupational groups. This will lead to a greater understanding of the State’s progress in developing Hawai‘i’s green economy and workforce.



Appendix A: A Closer Look at the Raw Data

In order to produce the best estimate of clean energy and energy efficiency jobs in the state of Hawai‘i, the greatest available tool was the responses to the 2010 Green Jobs Survey. The pool of respondents to the 2010 survey that had reported green jobs became the foundation upon which the sample of employers that were contacted for the purposes of this study was built. Of the 1,250 employers the survey was sent to, 664 responded and 202 reported having jobs in one of the two core areas (only 189 however listed the jobs). The total number of jobs reported was 1,691 with 575 in the Generate Clean Energy core area and 1,116 in the Energy Efficiency core area (the number of jobs reported by respondents to the 2010 survey were 379 and 542 respectively). The larger number of jobs is to some extent indicative of the increase in the number of jobs, but no further conclusions should be drawn from these numbers for a number of reasons (the sample selection was different and while more employers responded in 2010, there were five targeted core areas, not two).



There were a total of 96 employers that responded to both surveys and reported having jobs in one of the two core areas, either in their response to one of the two surveys or in both 2010 and 2015. These employers reported a total of 498 jobs in one of the two core areas in 2010 (154 in Clean Energy and 344 in Energy Efficiency), while the number of jobs had increased by 28% in 2015, giving us a total of 638 jobs - 133 in Clean Energy and 505 in Energy Efficiency.

This indicates that there has been a significant increase in the number of jobs, and may not even give us the whole picture of how the number of jobs has increased since there are new companies that are not included in this subgroup.

Appendix B: What is NAICS?

The North American Industry Classification System (NAICS) is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. At the heart of NAICS is a production-based concept of classification, that is, NAICS classifies each establishment into a detailed industry based on the production processes it uses. The NAICS system provides five levels of classification on detailed codes that have a maximum of six digits. NAICS was developed under the auspices of the Office of Management and Budget (OMB), and adopted in

1997 to replace the [Standard Industrial Classification \(SIC\) system](#). It was developed jointly by the [U.S. Economic Classification Policy Committee \(ECPC\)](#), [Statistics Canada](#), and Mexico's [Instituto Nacional de Estadística y Geografía](#), to allow for a high level of comparability in business statistics among the North American countries.

More information about the NAICS can be found at <http://www.census.gov/eos/www/naics/>

The following table provides detailed information on the structure of NAICS at the two-digit level, which is what this report focuses on.

Table 4. NAICS 2-Digit Sectors

NAICS Code (2-Digit)	Industry Sector
11	Agriculture, Forestry, Fishing and Hunting
21	Mining, Quarrying, and Oil and Gas Extraction
22	Utilities
23	Construction
31-33	Manufacturing
42	Wholesale Trade
44-45	Retail Trade
48-49	Transportation and Warehousing
51	Information
52	Finance and Insurance
53	Real Estate and Rental and Leasing
54	Professional, Scientific and Technical Services
55	Management of Companies and Enterprises
56	Administrative and Support and Waste Management and Remediation Services
61	Educational Services
62	Health Care and Social Assistance
71	Arts, Entertainment, and Recreation
72	Accommodation and Food Services
81	Other Services, except Public Administration
92	Public Administration

Appendix C: What is SOC?

The 2010 Standard Occupational Classification (SOC) system is used by Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data. All workers are classified into one of 840 detailed occupations according to their occupational definition. To facilitate classification, detailed occupations are combined to form 461 broad occupations, 97 minor groups, and 23 major groups. Detailed occupations in the SOC with similar job duties, and in some cases skills, education, and/or training, are grouped together.

The table on the right includes a list of the 23 SOC major groups. A detailed list of all occupations groups can be found at: http://www.bls.gov/soc/major_groups.htm

Source: Bureau of Labor Statistics

Table 5. 2010 SOC Major Groups

2010 SOC Major Groups

Each occupation in the SOC is placed within one of these 23 major groups:

- 11-0000 Management Occupations
- 13-0000 Business and Financial Operations Occupations
- 15-0000 Computer and Mathematical Occupations
- 17-0000 Architecture and Engineering Occupations
- 19-0000 Life, Physical, and Social Science Occupations
- 21-0000 Community and Social Services Occupations
- 23-0000 Legal Occupations
- 25-0000 Education, Training, and Library Occupations
- 27-0000 Arts, Design, Entertainment, Sports, and Media Occupations
- 29-0000 Healthcare Practitioners and Technical Occupations
- 31-0000 Healthcare Support Occupations
- 33-0000 Protective Service Occupations
- 35-0000 Food Preparation and Serving Related Occupations
- 37-0000 Building and Grounds Cleaning and Maintenance Occupations
- 39-0000 Personal Care and Service Occupations
- 41-0000 Sales and Related Occupations
- 43-0000 Office and Administrative Support Occupations
- 45-0000 Farming, Fishing, and Forestry Occupations
- 47-0000 Construction and Extraction Occupations
- 49-0000 Installation, Maintenance, and Repair Occupations
- 51-0000 Production Occupations
- 53-0000 Transportation and Material Moving Occupations
- 55-0000 Military Specific Occupations

Appendix D: Survey Instrument

Hawai'i Clean Energy Jobs Survey



Research & Statistics Office

Department of Labor & Industrial Relations
830 Punchbowl Street, Room 304
Honolulu, HI 96813
Tel: 808.586.9097 Fax: 808.586.9022

ABOUT THIS SURVEY

March 1, 2015

In 2010, the Research & Statistics Office (R&S) published *Hawaii's Green Workforce: A Baseline Assessment*, the first comprehensive study of Hawaii's Green economy as well as green jobs projections for the state. While the Baseline Assessment provided definitions and a comprehensive framework regarding green jobs, it also highlighted the **need to update information and projections for green jobs** on a periodic basis. The Hawaii Energy Policy Forum (HEPF) is responsible for a multi-phase project to develop meaningful metrics and status reports to measure Hawaii's progress towards its clean energy goals. One of the metrics of the project is the effect of producing desirable green jobs.

In 2015, R&S and HEPF are conducting this survey to gather updated job estimates and projections for green jobs related to clean energy. Your firm was selected because we are surveying firms in our State that produce any goods or provide services that relate to the **Generation of Clean, Renewable, Sustainable Energy** (*Produce, transmit and store clean renewable energy from solar, wind, hydro, geothermal, ocean and small-scale biopower sources*) and **Energy Efficiency** (*Produce or install energy-efficient products; provide energy-efficiency services; improve energy efficiency of buildings; improve energy distribution and transportation.*)

Please complete this survey or forward to your Operations Manager or Human Resources Department. Include information about all of your locations in Hawaii. All information collected will be kept confidential and will not be provided to other entities and will be used for statistical research purposes only. Survey results will be presented in aggregate form only so that no individual responses will be identifiable.

To complete this form online, go to:

PLEASE REPORT FOR ALL YOUR HAWAII BUSINESS LOCATIONS

- If your company does have employees in clean energy-related occupations, please complete both pages and return this survey.
- If your company does **not** have any employees in clean energy-related occupations, please check this box, complete the information in the next (green) section, and return this survey.

Total number of employees you currently have in Hawaii _____

YOUR CONTACT INFORMATION

Company _____

Name _____

Title _____

Telephone _____

Email _____

Hawai'i Clean Energy Jobs Survey



- Enter the total number of workers in each column for all job titles. Write 1-3 phrases in the description section so we can have a better understanding about what the jobs are.
- Count full and part-time workers equally.
- Exclude consultants, outside contractors, vendors, and others not considered employees.
- Return your completed form in the enclosed stamped envelope or fax both sides to 808-586-9022.
- The deadline to respond is **March 31, 2015**.
- Contact us at 808-586-8999 if you have any questions.
- If you need more space, please attach additional pages or contact us for another copy.
- Your prompt response is appreciated and will reduce follow-up costs.

Job Titles and Job Descriptions Related to <input checked="" type="checkbox"/> Generation of Clean/Renewable/Sustainable Energy and <input checked="" type="checkbox"/> Energy Efficiency <i>(See definitions in About this Survey on page 1.)</i>	Check the Green Area for the Position	Number of Current Employees in Position	Number of Current Vacancies for this Position	Number of Workers You Expect in this Position in 2017
Job Title: Description:	<input type="checkbox"/> <input checked="" type="checkbox"/> Generate Clean Energy <input type="checkbox"/> <input checked="" type="checkbox"/> Energy Efficiency			
Job Title: Description:	<input type="checkbox"/> <input checked="" type="checkbox"/> Generate Clean Energy <input type="checkbox"/> <input checked="" type="checkbox"/> Energy Efficiency			
Job Title: Description:	<input type="checkbox"/> <input checked="" type="checkbox"/> Generate Clean Energy <input type="checkbox"/> <input checked="" type="checkbox"/> Energy Efficiency			
Job Title: Description:	<input type="checkbox"/> <input checked="" type="checkbox"/> Generate Clean Energy <input type="checkbox"/> <input checked="" type="checkbox"/> Energy Efficiency			

Mahalo for your participation!

