The dual promise of green jobs

A qualitative study of federally funded energy training programmes in the USA

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Abstract

Purpose – The aim of this paper is to review the policy literature on green jobs and green jobs training in the USA and to present findings of a qualitative study on the start-up of two Energy Training Partnerships (ETP) funded by the US Department of Labour to train workers for green jobs.

Design/methodology/approach – The paper includes a review of the policy literature, document reviews, and interviews with administrators, employers, educators, workforce officials. The literature presumes green jobs training will help create jobs and that these jobs will provide opportunities for the poor. This study examined these propositions within the context of the ETPs.

Findings – Stakeholders faced challenges related to a misaligned infrastructure, lack of synchronization in the labour market, and workforce gaps. They responded by coordinating available resources in innovative ways. Though many policy propositions were confirmed, the premise that green jobs are a pathway of poverty was not. Entry requirements were high and programmes lacked funds for long-term education.

Research limitations/implications – Because the sample was small and little was known about the nature of emerging jobs, more research is needed on green jobs and their skill requirements.

Practical implications – The study found that coordination on the policy and programme levels helped stakeholders respond to challenges. Also, new opportunities for the poor may be realized by embedding short-term training in a broad continuum of education and strategically linking both to economic development activities.

Originality/value – Little is known about how training aligns with emerging industries. This study helped fill this gap by examining how stakeholders responded to the demands of the green sector.

Keywords Green jobs, Workforce development, Economic development, Emerging occupation, Policy, Careers, Technical education, United States of America, Training

Paper type Research paper

Introduction

The worldwide recession has resulted in massive jobs loss and industrial restructuring. Many low-skilled jobs have been wiped off the rolls and economists predict that they will not return (Carnevale *et al.*, 2010). In their wake a new labor market, requiring post-secondary credentials and the ability to continuously learn has emerged (Holzer and Lerman, 2009). When the economy recovers, analysts predict a significant

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mismatch between the skills of the workforce and the requirements of emerging jobs (Carnevale *et al.*, 2010).

These trends have given rise to new calls in the USA for the integration of training and development with economic development so that both can be aligned with the political economy. This transition may be difficult for some training and development practitioners. Though practitioners are experts in the design and delivery of quality training and development programmes, they usually do not engage in the broader policy debates that shape their work. These debates, as well as the resulting policies can be enhanced by practitioner input.

The American Recovery and Reinvestment Act of 2009 provided the US Department of Labor with $500 million to prepare workers for careers in the emerging energy efficiency and renewable energy industries. A total of 25 awards were made to local Energy Training Partnerships (ETP) to develop a new workforce development system to meet the needs of both employers and workers. Funds were utilized to design and distribute new curriculum and programmes to train workers in industry credentials and place them on a career path in green industries. Department of Labor officials recognized that the success of this strategy would rest on close coordination and collaboration among multiple stakeholders across the political-economy of the emerging green energy sector (US Department of Labor, 2009).

This paper reports on a study of the early start-up experiences of two of ETPs. The purpose of this study was two-fold:

(1) To explore the challenges and corresponding strategies utilized by stakeholders in the ETP as they grappled with the dynamics of the emerging energy sector.

(2) To understand the degree to which the social and economic benefits of green jobs espoused in the policy literature matched the intentions and experiences of stakeholders engaged in building new green jobs training programmes.

Though this study examined US policies and practises, it may provide insight for training and development practitioners in other industrial economies as they shift to a more carbon-neutral economy. Indeed stakeholders throughout the industrialized world share many challenges to preparing workers for jobs in the emerging green economy. For example, a United Nations report on green jobs in Asia and the Pacific identified many of the same challenges facing policy makers and industry in the USA ((United Nations Economic and Social Commission for Asia and the Pacific, 2012). For example Asian and Pacific nation are limited by the lack of systematic education training infrastructure to cultivate a green workforce. As in the USA the task of building this system is complicated by limited knowledge of green job profiles. These limitations aside, analysts worldwide assert that there is great opportunity for green jobs to protect the environment and provide a pathway out of poverty for the world's poor (Jones, 2008, Renner *et al.*, 2008).

The dual promise of green jobs

The climate change debate has surfaced the inherent conflict between the environment and the carbon-based economy (Renner *et al.*, 2008). Recently the debate has broadened to include concern for the social dimensions of sustainable development (Anderberg, 2008). These debates have in part played out in economic policy reports on green

industries and jobs. A key proposition underlying this literature is that many of the world's complex problems share a common cause: social inequity. Today in the USA for example, 34 percent of income is concentrated in the top 5 percentile (Kumhof and Ranciere, 2010). At the same time 22 percent, or one in five Americans hold poverty-wage jobs (Jones, 2008), and 29 percent of American families are living 200 percent below the federal poverty line. Some argue that this inequity threatens the environment and society because it undermines the social cohesion required for people to rise to a common cause (Speth, 2010; Jones, 2008).

The United Nation's Environmental Programme (UNEP), which provides worldwide leadership on improving the environment, sees a dual promise of the green economy to protect the environment and provide decent work to the world's poor (Renner *et al.*, 2008). The social opportunity lies in the emergent character of green industry because the structure, nature, and scope of the jobs are malleable and open to influence from a variety of interests and stakeholders. Consequently, green jobs may offer policy makers and training and development practitioners a rare opportunity to examine not only how workforce development programmes can prepare workers for jobs in emerging industries, but also whether and how economic and workforce development resources can positively affect the nature of work and the opportunity structures in the emerging green economy.

Indeed many argue that green industries should be more socially accountable because worldwide government investment in the industry has been unprecedented. In 2009, the G20 governments invested roughly $400 billion in clean technology (Cleantech, 2009). In the same year, the American Recovery and Reinvestment Act (ARRA) invested $110 billion in the green economy to include $1 billion for education and training in energy efficient technology and $500 million to train workers for new and emerging green jobs (Bozell and Liston, 2010).

The leaders who supported these policies have placed a risky bet that government investment in green industries will revitalize the US economy and put Americans back to work. Yet the massive influx of tax dollars to stimulate a private market has led social advocates to press for policies to ensure that these investments also deliver economic justice (Jones, 2008; Pinderhughes, 2007; Speth, 2010). For example, Pinderhughes (2007, p. 12) asked:

> Who will benefit from these investments…? Will investments in green economic development reinforce existing patterns of social and racial inequity by primarily creating new green business opportunities for the wealthy, new consumer choices for the affluent and new workforce opportunities for adults with relatively high levels of education and skill? Is it possible to structure investments in green economic development so that they bring new opportunities and benefits to low-income people and communities?

Yet little is known about green jobs so there are questions about whether and how the emerging labor market can provide opportunity to low-income people (White and Walsh, 2008). Further complicating this goal is that many poor people lack the education and skills required by higher paid and secure work in other industries. Building new structural opportunities in the green labor market will surely require comprehensive training and development strategies to help the working poor develop foundational knowledge as well as technical competencies (Dierdoff *et al.*, 2009).

Absent hard data, the US policy literature on green jobs is based on a series of propositions that must be critically examined in light of the real experiences of the stakeholders involved in building the green industry sector. The following section summarizes many of the policy propositions. This summary is followed by a brief overview of the two ETPs examined in this study. A discussion of the findings related to the challenges and strategies in each of the ETPs is followed by an analysis of whether and how the assertions in the literature are affirmed by the experiences of the study participants. The paper concludes with the implications for training and development.

Context: features of green jobs and emerging labor market

The propositions that form the argument of the dual promise of the emerging green labor market are found in Table I.

What is a green job?

The massive public investments in green industry are motivated in part by the political aim to jumpstart the economy and create jobs. The politicians and officials who enacted these policies are feeling pressure to show a return on the publics' investment. Thus, a central political question in the USA today is how many new green jobs have been created as a result of government investments in the green economy? But this question first begs a more fundamental one: What is a green job?

Table II summarizes three different definitions of green jobs found in the literature: the normative, the industry, and the occupational definition. Though there is some overlap between these definitions, each has implications for whether specific jobs are counted as green jobs.

Definition of green jobs	Normative
	Industrial
	Occupational
Green jobs labor market dynamics	Good jobs: decent pay/benefits, meaningful work
	Local jobs that cannot be outsourced
	Low barriers to entry
	Skilled green jobs: new speciality for a core occupation
	Advancement and mobility opportunities
Green industry dynamics	Virtuous growth cycle/radiating growth
	Skill shortages hold back industry growth
	Demand oriented growth
	Risky investment climate mitigates growth
	Role of government intervention and incentives
Workforce development challenges	Emerging structure of the industry and occupations make is difficult to serve
	Lack of synchronization between the supply and demand sides of the labor market
	Reactive workforce development policies and practises make it difficult to respond to emerging occupation

Table I.
Features of green jobs in the literature

Normative	Industrial	Process/occupational
"Well paying, career track jobs that contribute directly to improving or enhancing environmental quality.... Range from low skilled, entry level to high skilled, high paid jobs, and include opportunities for advancement in both skill and wages.... Tend to be local work transforming and upgrading the immediate built environment and natural environment.... Simply put, if a job improves the environment but doesn't provide a family-supporting wage or a career ladder,... it is not a green job" (Gordon *et al.*, 2008)	"A green job is one in which the work is essentialto products or services that improve energy efficiency, expand the use of renewable energy, or support environmental sustainability. The job involves work in. . .green economic activity categories [i.e. specific industries]. . . " (Bureau of Labor Statistics, 2010)	"Green activities have different effects on different technologies. A more prudent approach is to focus on the 'greening' of occupations, which is defined as the extent to which green economic activities and technologies increase the demand for existing occupations, shape the work and worker requirements needed for occupational performance, or generate unique work or worker requirements" (Dierdoff *et al.*, 2009, pp. 4)

Table II.
Perspectives and conceptual frameworks on green jobs

There are several conceptual and practical challenges to defining a green job (Dierdoff *et al.*, 2009). First there is no common nomenclature that can be used across the variety of industries and professional fields that are involved in the emerging industry. Experts from across the economy talk about green differently, and they do not share a common vocabulary for discussing the implications of green technologies and practises on the work in specific sectors (Anderberg, 2008).

Second, there are challenges to differentiating green from non-green jobs within a sector or occupation. Green activities and technologies have different effects on existing occupations (Dierdoff *et al.*, 2009). Also, the greenness of a job classification may vary widely across different workplaces because green is closely tied to the idiosyncratic tasks and work routines in specific workplaces (Anderberg, 2008; White and Walsh, 2008). Thus not all jobs in an industry or occupation with high potential to be green can be counted as green.

A third and perhaps a threshold challenge to counting green jobs is that green technologies and practises are new little can be known about their occupational impacts. More information is needed about the nature of green work and worker requirements before nomenclatures and methods can be devised for counting the number of green jobs (Anderberg, 2008; Dierdoff *et al.*, 2009).

Labor market dynamics

Despite the challenges to defining and counting green jobs, green jobs do exist that can serve as models. According to some analysts (Renner *et al.*, 2008, 2009; Gordon *et al.*, 2008; Jones, 2008; Pinderhughes, 2007), these existing jobs validate the normative definition of green jobs because they pay more than other jobs in the same skill range and some offer advancement potential(Pinderhughes, 2007). Pinderhughes (2007) also found, and others have confirmed (Renner *et al.*, 2008; Jones, 2008), that workers associated green jobs with cleaning the environment and improving the quality of life, so they consider green jobs a source of meaningful work.

Another purported positive characteristic of green jobs is that they are local jobs that are less likely to be outsourced. As Jones (2008, pp. 10-11) stated:

> To green ourselves as a nation, much of the transformation will occur in our everyday lives from where we live, work, and how we get around. For this to occur, work in our communities and cities cannot be outsourced.

Though Pinderhughes (2007) found that employers hired individuals without degrees or postsecondary credentials and trained them for green jobs, others do not concur with this finding (Stone, 2010; Dierdoff *et al.*, 2009). For example, the US Department of Labor's Office of Apprenticeship conducted a focus group of directors of apprenticeship training programmes to discuss the greening of the skilled trades. The directors claimed that job quality, workplace safety, and long-term career stability could only be assured if workers were prepared with the basic skills and knowledge of the occupation. They claimed green jobs required education and experience in a trade as well as training in green technologies and procedures (US Department of Labor, Employment and Training Administration, 2009).

Stone (2010) shed light on the disagreement over the minimal level of skill and education required by green jobs. He observed that although green jobs are found across the skills spectrum; the jobs in great demand and that are also expected to grow are middle-skilled jobs that require postsecondary education or credential.

The normative definition green jobs may rest on whether green jobs actually do provide access to well-paying career-track jobs to low-skilled workers. If the minimum entry requirement for good green jobs is set at the postsecondary level, then job growth strategies must be accompanied by education and training programmes to ensure access to all workers.

Industry dynamics

Though it is unclear whether green jobs will emerge as a significant source of employment growth in the long term, some analysts described a virtuous cycle of radiating market growth (Renner *et al.*, 2008; Anderberg, 2008; Stone, 2010). As other industries adopt or integrate green technologies and practises, they may experience energy cost savings and market advantages that can be reinvested to fuel economic expansion and job growth in those sectors (Renner *et al.*, 2008; Anderberg, 2008).

However, employers in key green industries have indicated that they are being held back or they anticipate being held back by skill shortages. For example, a survey of members of the National Association of Manufacturers who produce green products to support radiating growth, found moderate to severe skill shortages in the industry (Gordon *et al.*, 2008). Also, the utility industry, a major actor in bringing renewable energy to scale, may lose one-quarter of the workforce to retirement by 2015(Gordon *et al.*, 2008; White and Walsh, 2008).

But the timing of the supply and demand of skilled workers in the green industry is difficult synchronize. It takes time to develop training and prepare workers with the core and speciality skills required to fill green skills gaps. Yet the gaps do not currently exist, they are anticipated. So until market growth occurs, training will be preparing workers with speciality skills for jobs that do not yet exist.

One reason it is difficult to predict the skill supply and demand cycle in the USA is that there several energy sources continue to vie for dominance including wind vs solar

vs biofuels or hybrid vs electric automobiles (Anderberg, 2008). Venture capital has been slow to invest until one or more of these technologies emerge as the market leader.

The lack of certainty in the market is why some argue that government should invest in the commercialization of green technologies (Anderberg, 2008, Apollo and Policy Matters, 2010). The magnitude of current federal investment in the industry and the demands of global climate change agreements also portend a large, activist role for government. That said, government policies and investments alone will not create new markets and build a new economy. Greening of the economy will take a balance of market-driven and public policy initiatives to bring green industries to scale (Renner *et al.*, 2008). Suggested government intervention includes favorable and guaranteed tax policies aimed at stabilizing the market for alternative products and systems (Agrawal *et al.*, 2007; Apollo and Policy Matters, 2010); investment in upstream research and development in the knowledge and infrastructure capacity required to bring green products at scale (Anderberg, 2008); and tax incentives to generate a market for green products.

Workforce development challenges

Workforce development programmes and practitioners face several challenges in responding to the education and skill needs of the emerging green industry. One challenge is the structure of the industry and jobs. The green industry in the USA is largely comprised of small to mid-sized firms that are geographically dispersed and not well organized, so it is difficult to engage them in workforce development forums and programmes (Bozell, 2010). Likewise, many green jobs emerge from within existing occupations that take on speciality tasks related to green activities and these tasks are difficult to identify and codify for training purposes (US Department of Labor, Employment and Training Administration, 2009).

Second, the lack of synchronization between the supply and demand sides of the labor market is a significant workforce development challenge (White *et al.*, 2010). First, the availability of federal job training funds for green jobs training has created incentives for educators to develop new training programmes before a significant number of jobs exist to place trainees (White *et al.*, 2010). In addition, because of the challenges related to defining and codifying green jobs, it is difficult to establish the meaningful skill standards and credentials that are needed to drive technical training (White *et al.*, 2010).

There are also several challenges related to workforce development policies in the USA. For example, federal job training funds are earmarked for short-term training and job placement for populations with barriers to employment, whereas many green jobs require broad education training in core occupational knowledge and skill, and/or a postsecondary degree or credential (Bozell, 2010).

On the practise side, workforce development practitioners have been trained to respond to the needs of a well-defined labor market whereas green jobs are evolving so it is difficult to predict worker skill requirements and areas of job growth (US Department of Labor, Employment and Training Administration, 2009; Anderberg, 2008). Finally, some say that a comprehensive certificate framework is needed to guide the planning and/or integration of existing programmes, curriculum, materials, and other training resources. This framework, they argue will ensure that limited training

resources are coordinated and that training results in valuable labor market credentials (Bozell and Liston, 2010; White *et al.*, 2010).

Study of the early start-up experiences of two energy training partnerships (ETP)

The two ETPs in this study were selected because they were:

- identified by Department of Labor officials as being ready for study;
- together the two represented significant differences in the mix of stakeholders, the targeted industries, the programmes offered, and the delivery strategy.

This variation was sought to explore two different sets of early start-up experiences. Data were collected through analysis of state workforce and economic development reports, review of ETP documents, and 11 semi-structured interviews with two programme operators (one per site), four employers (two per site), three educators (one in New England and two in the Northwest), and two workforce development practitioners (one per site). Data analysis consisted of a constant comparative method where data from one interview were compared with data from other interviews in each peer group, in each site, and then across the two sites.

Site one, located in New England was formed in January 2010 with a $4.8 million ETP grant to a community service agency with strong ties to the community service sector in the state. It had been working with an area technical college to train low-income workers in home weatherization skills prior to the grant. The agency also teamed with the regional workforce development board, which was funding in-house training for local firms entering into the green market. Grant goals were to advise and place 398 students in weatherization training and place them in related jobs and to fund customized training for 2,000 workers employed by participating employers and apprenticeship programmes.

The two employers interviewed were manufacturers entering into new green markets. Both had upgraded their production system and were preparing to retrain employees. Batteries, Inc. (pseudonym) had built capacitors in the state for over 50 years. After two grants from the US Department of Energy – $9 million for R&D and $9 million to build a new production facility – the company was ready to begin production on capacitors for hybrid vehicles. The new facility was state of the art and all employees required retraining on the new equipment and in lean manufacturing. The company planned to double its workforce in the next 4-5 years. Home Products, Inc. manufactured home lawn products and was planning to build new green home products. The company employed 200 workers, mainly in assembly jobs. They were training employees in lean manufacturing to ensure for quality production of the new product. The employer was unclear whether they would hire additional workers for their green market.

Site two, in the Pacific Northwest was formed in early 2010 with a $5 million ETP grant to a Manufacturing Extension Partnership, which provided technical assistance and worker training to help manufacturers upgrade production systems and improve performance. The funds were used to form a regional public-private partnership in the renewable energy industry with firms that stretched over nine contiguous counties across two states. Its mission was to connect the small and mid-sized manufacturers to

the supply chain for the renewable energy industry in the region. Grant funds were used for an audit of the product needs and manufacturing specifications within the renewable energy sector and to help manufactures meet those needs through upgrades to the production systems. The goal was to train of 1,670 workers in advanced manufacturing.

The two employers were in the renewable energy industry. Solar, Inc. was established in 1980 as an independent contractor specializing in the sale, installation and service of solar energy products. They had 15 full time employees, mainly electricians and plumbers. The workforce doubled in the summer months. The company was working with the ETP to recruit and train the extra employees needed to meet the seasonal demands of the industry. Composite Inc. was a small family-owned company that makes composites for a variety of industries. In 2007 the company began to manufacture and repair wind turbines. The repair business was problematic due to high turnover of employees requiring specialized skills. The company was working with a local educator to develop a wind turbine repair certification program prior to the award of the ETP grant. Funds were being used to pilot and expand the training to other business in the region.

A brief description of the employers and educators in this study is in Table III.

Start-up challenges and strategies

The participants shared common challenges related to lack ofinfrastructure to support entry into the green sector, lack of synchronization in labor market, and the workforce.

Infrastructure

Participants faced challenges related to a mismatch between the stakeholders' internal structures and systems and the demands of the green industry.

Industry	New England	Pacific Northwest
Renewable: installation and repair	Center for Sustainability: weatherization training and certification/job placement services in the building and construction industry for unemployed and contractors	Solar, Inc.: solar installation company with on-the-job training in solar speciality skills to trade workers Composites, Inc.: composite manufacturer with service contracts to repair wind bladeswith in-house training/certification for wind blade repair technicians
Renewable: manufacturing	Batteries, Inc.: manufacturer of new capacitor technology with in-house training and certification for all employees in advanced manufacturing Home Products, Inc.: manufacturer of do-it-yourself solar energy units with in-house training and certification for production employees in advanced manufacturing	Energy Community College: green career pathways leading to certifications and degrees in green related skills and occupations River Community College: customized green manufacturing specialist training and certification for incumbent and unemployed workers

Table III.
Interview sample by industry sector per site

Batteries, Inc.'s management systems and manufacturing processes did not meet the quality standards required by its new green customers.

> . . .[Y]ou first have to . . . have the infrastructure that can support growth. . . You have to have the systems to record costs, data. . .the systems that will make sure you use your labor and materials wisely, and that represents a significant culture change.

Home Products, Inc.also experienced this challenge. Both talked about the need for employees to be more engaged. Employees needed to know more about product and the customer and they required continuous training. Both planned to increase wages to compensate employees for their enlarged role.

In the Northwest, Composites, Inc.'s internal job structures and hiring procedures were incompatible with the wind repair service business. These jobs were difficult to fill because wind repair work is seasonal and highly mobile and it requires specialized skills. The employer was working with the Energy Community College to develop a new training and certification programme that was linked to a broader continuum of education. Students would be qualified for wind jobs, and they could apply their training to an advanced degree to put them on a career path in the energy industry.

The director of the Center for Sustainability in New England also faced infrastructure challenges. For example no one at the school had the expertise required to develop and teach new green training programmes, so she had to hire an industry consultant to fill the void. Yet the onboarding procedures at the school were not nimble enough. ". . .[S]o, things like procurement procedures and accounting. . .and paying quickly and all that isn't often part of your day-to-day in a small college. Procedures had to be adapted."

In the Northwest, the two educators also faced structural challenges. Energy Community College had difficulty finding faculty with the expertise to deliver the new wind blade repair technician certification programmes. This problem was resolved through a partnership with Composite, Inc. wherein the school hired an expert out to the plant to develop and pilot the training, and the employer provided an internship for a faculty member so he could gain first-hand knowledge of the job requirements in the industry.

River Community College was not organized to service the new student population. In the past, the division largely served incumbent workers. The new funding opened the division's programme to displaced workers, many of whom were not prepared with the skills needed to succeed in the training. In response, the college worked with employment services to develop a robust assessment to evaluate the students' knowledge and determine whether they were prepared to meet the demands of the programme. Students who did not meet entry requirements were referred to a basic education programme.

Synchronization

All participants struggled to establish a cadence in the green jobs labor market. Most acknowledged that the timing between job growth and training was off. On the job side, the employers knew that when the market grew, they would need more workers with specialized skills. Home Products, Inc. in the early stages of entering the green market knew that that the new green product would require new speciality skills, but he did not know what those skills might be. The lack of clarity was delaying the

in-house training and causing problems in how to describe the new jobs to potential recruits.

Batteries, Inc. was further along in their entry into the green market, so they were aware of the skills required and the number of workers they would eventually need, but they did not know exactly when they would need to additional workers. The company was managing the incremental growth by training existing employees in new roles and tasks, meanwhile they were also working with the ETP career counselors to develop a plan to recruit and screen new employees once the product took off.

In the meantime, the Director of the Center for Sustainability was struggling to meet the expectations of the ETP grant to train and place students in weatherization jobs that did not exist. She talked about the effect of this mismatch on students.

> The training not only develops skills but gives them a sense of accomplishment and . . .that really begins to make a difference.... But then I feel. . .guilty. . . because they can't find a job... So we have given them a lot of self-confidence and hope, and new skill, and that's great, but they're still going to be sitting at home. It's just, that's not okay on some levels.

The educator was considering broadening the education and training beyond basic weatherization skills to provide trainees more options in the labor market. The challenge however was that the grant funds did not pay for this expanded education.

In the Pacific Northwest, the administrator at Energy Community College shared his concern about the overemphasis in education on the green sector, especially since many of the anticipated jobs have yet to materialize. His solution was also to provide broad education and deep technical training to provide students flexibility and put them on a career track.

The employers in the Pacific Northwest were keenly aware of the risk in the renewable market, and they too were concerned whether the promise of long-term market growth and job creation would be realized. The Composite Inc. representative expressed her concerns.

> At the federal level, we pass legislation every two years whether to support the wind or not, and so when you're gearing up to have a career, a lifetime career, and not knowing how that industry is going to survive or make it, I think makes people a little uneasy.

Thus, it appeared that the participants were keenly aware that though skills and training were important factors in the renewable energy industry, workforce development strategies needed to be combined with stable economic policies to ensure job growth in the industry.

Workforce

The gaps in the green jobs labor market did not appear to be solely related to timing, however. For example, in New England, Batteries Inc. had the difficulty finding job candidates who met the minimum entry requirement of a high school education. "This is a small area, and of course, the labor pool is always a question."

Also, the Director of the Center for Sustainability and the workforce development representative identified gaps in the geographic distribution of students, which created challenges in establishing a critical mass of trainees for programmes. The Director talked about how the school was responding.

> We still have certain constraints, but right now. . .we have started saying to people, "Well, if you have three people or four people down in southeast who are ready for this in two weeks. . .we'll come down and teach it," instead of waiting for the monthly offering on campus. . .

In the Northwest, concerns over the uncertainty in the green labor market and its ability to absorb the ETP trainees were expressed alongside frustrations over the lack of skilled workers for existing green tasks and jobs. The Composite Inc. employer talked about how the lack of expertise in wind farm maintenance was hurting the reputation of the sector.

> Because the wind blade repair... is a complicated process... and there were a lot of people out there that didn't have the skills... trying to do those repairs and it was kind of giving the industry a bad name.

Solar Inc. shared a similar problem with highly skilled journey level workers who lacked the speciality skills.

> So, we had five crews led by electricians who were all doing the wrong thing – little, petty things – but still going back and fixing all that was a huge cost and loss of energy.

These skills gaps and the real economic consequences motivated the employers in this study to engage with educators and workforce development practitioners to develop new training and certification programmes for workers.

Discussion

Table IV compares the experiences of the participants to propositions in the literature.

Green jobs labor market

The three definitions of green jobs, including the industrial, the occupational/process, and the normative, were observed in this study. For example, green jobs were talked about as being related to specific industries, like the solar industry. Green was also described as a process by which existing jobs are retrofitted with new speciality skills to take on new green-related work. None of the four employers had created totally new jobs; they each had the need for enhanced speciality skills to be added to the core functions of existing jobs. Even the parties involved in developing the new wind blade repair technician training and certification understood that though this is a new occupation, it required a core set of mechanical and trade skills that already existed in the labor market.

Aspects of the normative definition were also affirmed. Almost everyone talked about the social value of green jobs and how the image of green work energized incumbent workers and attracted new recruits to technical fields. While all agreed that green jobs provide opportunity for meaningful work, some acknowledged that the working conditions were difficult. For example, the seasonal nature of some of the jobs created insecurities and raised questions about whether all green jobs are good jobs. However all employers in the study paid slightly above the national average. In addition, each was providing training linked to advancement opportunities and each thought that green jobs would continue to change in ways that upgraded the skills requirements, thus providing employees with new career opportunities.

Features of green jobs	Experience
Definition of green jobs	
Normative	Affirmed
Industrial	Affirmed
Occupational	Affirmed
Green jobs labor market dynamics	
Good jobs: decent pay/benefits, meaningful work	Affirmed
Local jobs that cannot be outsourced	Uncertain
Low barriers to entry	Not Affirmed
Skilled green jobs: new speciality for a core occupation	Affirmed
Advancement and mobility opportunities	Affirmed
Green industry dynamics	
Virtuous growth cycle/radiating growth	Affirmed
Skill shortages hold back industry growth	Affirmed
Demand oriented growth	Affirmed
Risky investment climate mitigates growth	Affirmed
Role of government intervention and incentives	Affirmed
Workforce development challenges	
Emerging structure of the industry and occupations make is difficult to serve	Affirmed
Lack of synchronization between the supply and demand sides of the labor market	Affirmed
Reactive workforce development policies and practises make it difficult to respond to emerging occupation	Uncertain

Table IV.
Features of green jobs in the literature as affirmed or disconfirmed by each case

Two features of the green job labor market were not affirmed in this study. Though employers were creating, or planned to create local jobs, there was no evidence to determine whether or not these new jobs could be outsourced. In addition, the proposition that green jobs have low barriers to entry was not confirmed. Each employer talked about how green jobs required at least a high school diploma, as well as strong basic skills, occupational knowledge and technical expertise.

Green industry dynamics

The cases also affirmed many of the propositions about the green industry. For example, the participants thought green products would result in radiating growth cycle in other industries. However, both cases affirmed that this cycle may be hindered by the risky investment climate which gave investors pause about investing in green industries. The awareness of this risk is perhaps one reason why several of the interviewees affirmed the need for government intervention and investment in new green markets.

Workforce development challenges

Several of the workforce development challenges related to green jobs in the literature were also affirmed. Many participants talked extensively about the challenges related to syncing training with jobs. One pathway out of this challenge was to link short-term green training programmes to a broader continuum of education that provided students with more options in the labor market. The instability of the industry and the unsuitability of traditional workforce development strategies for emerging green jobs

were also affirmed. Many of the participants in supply-side agencies talked about how their work in green jobs required them to rethink their policies and practises so they could be more responsive to the uncertain demands of an emerging industry.

Conclusions and implications for training and development

The green jobs in this study were not new jobs; rather employers were adapting existing jobs to meet the demands of new market opportunities in the emerging green economy. Looking across the four workplaces it may be said that the emerging green jobs required a higher component of knowledge intensity (Martinez-Fernandez *et al.*, 2010), meaning that workers not only needed new technical skills, but they also needed a deep understanding of the work processes, the market demands, as well as the needs of specific customers in order to help the employer respond to the uncertainty in the emerging green economy. Thus an argument may be made that the green jobs in this study required a new type of occupational knowledge, knowledge that enabled workers to perform occupational tasks as well as combine, manage, improve and change work tasks and processes as the circumstances required.

This conclusion has implications for training and development. On the policy level training and development can support the development of federal and local policies that help employers and worker transition from existing to green jobs. For example, the field can conduct much needed policy research on the implications of the green economy for the labour market. Specifically training and development researchers can bring their unique the perspective on skills and knowledge demands that this transition will place on workers in traditional as well as emerging industries.

In addition, the field should bring new empirical evidence to the question of what is the right balance of education and training needed to help workers enter and/or make successful transitions to knowledge intensive green jobs. While the study participants acknowledged the need for short term job training they also realized that it was not enough to provide employment security in the uncertain labour market. Though some of the educators did offer the broader education and training required by knowledge intensive green jobs, they lacked the resources to prepare low-qualified workers with the basic skills and occupational knowledge required to succeed in those programmes. Thus the low-qualified workers were trained in skills that had a very short shelf-life and placed in insecure jobs, further trapping them in a vicious cycle of low-waged work. If green jobs are to achieve their dual promise, new policies are needed to address the educational needs of the low-skill workers and to link basic education to ongoing education and employment in green jobs.

On the programme level training and development practitioners might focus on developing new curricula and degree structures that make education and credentials more accessible to low-qualified and incumbent workers who are transitioning to green jobs. New career pathways that link short term training in industry recognized credentials to an ongoing program of education in an advanced degree will help workers to move in and out of work and learning to advance in their education as well as career.

Proposed here is a new, more integrated education and workforce development system wherein training and development professionals intimately familiar with the demands of the labour market. Training and development professionals will need to

develop new partnerships within their own work location, as well as across their industries and regions to both learn green work and its skill demands, and to work with employers and workers to make education, training and credentialing an integrated part of the work and transition processes.

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