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## A GREEN LABORATORY: SOME FINDINGS FROM RECENT EXPERIENCE

The cases that follow look at various constellations of these elements in workforce development projects across five sectors: Construction, Manufacturing, Electric Power, Health, Water.

None, of course, are perfect. And all operate under the hostile political and economic circumstances of a crushing recession, a weak recovery, and an intransigent congress (hostile to robust government and green anything). But we tried to lift up examples where **a)** greening competency-based skill standards is adding or could create value for workers and businesses, helping to deliver both quality work and quality jobs; **b)** green sector partnerships could more effectively link labor supply and demand, particularly in marginalized or vulnerable communities; and **c)** bridge or pathway strategies provide the broadest access to skill upgrades (and related labor market advancement) for the broadest set of workers.

*Case Study 1*

## GREENER CONSTRUCTION: WEATHERIZATION AND ITS DISCONTENTS

Perhaps no industry has embodied the promise and perils of the green economy more completely than the home retrofit industry. Over the last several years, advocacy groups and policymakers became increasingly focused on the multiple opportunities presented by significantly increasing the scale of the energy efficiency upgrades of America's homes. The basic premise has been articulated ad nauseum by COWS and allies across the country for more than a decade, but it's worth repeating.<sup>130</sup> The more than 100 million homes in the U.S. account for roughly 23 percent of the country's energy use and carbon dioxide pollution,<sup>131</sup> retrofitting them is therefore a global warming and energy savings solution. It is also an economic solution: on the consumer side, it saves households money by lowering energy costs, which is particularly impactful for low-income households; on the worker side, it is a labor-intensive industry that creates jobs, potentially lots of them, and potentially accessible to workers entering the labor market with lower education and skill levels.<sup>132</sup>

In 2009, the moment arrived to turn rhetoric into reality. The financial crisis that began in the fall of 2008 and the (not unrelated) election to the Presidency of Barack Obama set the stage for the passage of the American Recovery and Reinvestment Act, which included an unprecedented level of investment in programs focused on building efficiency upgrades. At the Department of Energy (DOE), the Weatherization Assistance Program (WAP) received a \$5B appropriation, and the State Energy Program and the Energy Efficiency and Conservation Block Grant programs were appropriated more than \$6B combined. The Recovery Act also included an appropriation of \$500M to the Department of Labor (DOL) to fund training programs that prepared workers for energy efficiency and renewable energy industries as defined in the Green Jobs Act.

These big federal investments threw into stark relief some of the challenges inherent in bringing the home retrofit

industry to scale. Many of these are market barriers, including high transaction costs, split incentives (landlords have little incentive to pay for retrofits when their tenants pay the utility bills), limited-term tenancy or ownership, the gap between the need for up-front capital and the long-term return from energy savings, and the lack of standardized debt instruments that can be bundled and resold to secondary markets.

The Recovery Act investments also made unavoidable two particular labor market challenges in the home retrofit industry: **1)** job quality is generally not good, as the industry is dominated (with a few notable exceptions) by contractors that pay low wages, provide few if any benefits, typically don't invest in the skills of their workers, and are sometime violators of wage, hour and other employment laws; and **2)** a lack of uniform skill standards, and nationally recognized certifications, for the primary occupations within the industry, and related accreditation of training providers.<sup>133</sup>

The job quality issue was made particularly visible by the inclusion within the Recovery Act of a prevailing wage provision (aka Davis-Bacon), which required contractors on construction projects receiving ARRA funds to pay workers no less than the 'prevailing' wage rate for the local area, as determined by DOL. For a number of federal programs, including the DOE programs noted above, this was a new requirement, one that generated a contentious debate about its efficacy and implications. In addition, the prevailing wage rates for workers on residential weatherization projects (as distinct from more typical residential construction projects involving renovation and repair) were not set by DOL until September 2009, which led to uncertainty and delayed implementation and confusion in some states.

No full evaluation exists of the prevailing wage requirement's impact on job quality and job creation in DOE programs that made big investments in home retrofits.

## MAKING SENSE OF ENERGY EFFICIENCY TRAINING: WHAT DO WORKERS NEED TO KNOW, AND HOW DOES ANYONE KNOW THEY KNOW IT?

The absence of national skill standards has prompted a number of efforts to better organize the supply side of the clean energy labor market, and align it more consistently with (high-road) industry skill demand.<sup>150</sup> Most of these rest in one way or another on the fulcrum of credentialing. Three recent examples, in particular, may improve the quality of work and training in residential retrofitting and related efficiency sectors.

### DOE GUIDELINES FOR HOME ENERGY PROFESSIONALS

The U.S. Department of Energy (DOE) Guidelines for Home Energy Professionals emerged from the Obama Administration's Recovery to Retrofit interagency workgroup and ARRA-period WAP Training and Technical Assistance Plan, which highlighted a need for both some sort of competence benchmarks and a related framework for worker certification. DOE worked with industry and labor to develop standard work specifications for residential energy upgrades, establishing minimum quality requirements for safely achieving desired health and energy outcomes. Together with the National Renewable Energy Laboratory, DOE convened industry leaders in home performance and weatherization to develop Job Task Analyses for four common jobs in the Weatherization Assistance Program: Energy Auditor, Retrofit Installer Technician, Crew Leader, and Quality Control Inspector. The Building Performance Institute (BPI), selected in a competitive process to develop and administer related certifications, is currently running professional certification pilots for those four occupations.<sup>151</sup>

### IREC/ANSI ACCREDITATION FOR RENEWABLE ENERGY AND ENERGY EFFICIENCY CERTIFICATE PROGRAMS

A new accreditation program from The American National Standards Institute (ANSI) and the Interstate Renewable Energy Council (IREC) aims to improve skill delivery and credential value in renewable energy and energy efficiency certificate programs. In a pilot that began

this spring, credit and non-credit programs will be evaluated against the Draft IREC Standard 14732: General Requirements for Renewable Energy and Energy Efficiency Certificate Programs. The standard, developed in consultation with industry experts, establishes quality thresholds for curriculum, administration, personnel, facilities, and equipment. Assessment to this new standard for specialty certificates will provide third-party verification to students, employers, consumers, public agencies, and policymakers, bringing some measure of quality assurance to a notoriously unregulated corner of the sprawling and disorganized clean energy credentialing marketplace.<sup>152</sup>

### AFL-CIO MULTI-CRAFT CORE CURRICULUM FOR THE BUILDING AND CONSTRUCTION TRADES

The Multi-Craft Core Curriculum is a common skills entry-point to joint industry registered apprenticeships in the AFL-CIO's Building and Construction Trades Department (BCTD). Designed as a single gateway to the trades for high-school and community college students, the Core Curriculum is also designed to provide an on-ramp to construction careers for youth disengaged from the labor market and adults in transition. The Building Trades "Core" was developed as a national industry credential by the National Apprenticeship and Training Directors in the construction industry to establish, for the first time, a set of standardized pre-apprenticeship competencies. The Core, which can be delivered as a free-standing course or integrated into existing training programs, but must be employed in partnership with a local or state Building Trades Council, teaches skills required in all building trades apprenticeships, regardless of craft. The BCTD has committed to the Emerald Cities partnerships described elsewhere in this paper. When economic recovery and green infrastructure development take off, and the apprenticeship pipelines re-open, this promises to be a welcoming, rationalized on-ramp to solid skills training for an urban, underserved workforce that traditionally viewed the trades as inaccessible.<sup>153</sup>

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However, a perception among job advocates has been that Davis-Bacon may not be a particularly effective tool to improve job conditions in the home retrofit industry, in large part because prevailing wages, by definition, reflect nothing more than current wages (and underlying power dynamics and business practices) in the industry. In this context, the home retrofit industry is very similar to the residential construction industry, where intense competition and very low rates of unionization drive down wages for workers. And so the prevailing wage in most local areas, in this analysis, falls short of a living wage.

One of the responses to this perceived weakness of prevailing wage requirements to address the job quality shortcomings of the home retrofit industry was to advocate for the use of quality training providers and worker skills certifications in the implementation of ARRA-funded programs, in particular WAP, the biggest of those programs. This effort was led by the Laborers International Union of North America (LIUNA), part of an ambitious strategy to take advantage of the Recovery Act investments, and increased public, political, and market attention focused on the home retrofit industry, to create family-supporting long-term construction jobs and, not incidentally, increase union density within the industry.

The peril of not taking such a course was articulated forcefully by the General President of LIUNA, Terry O'Sullivan, in a letter sent to Governors:

“The scale of new federal investment in residential weatherization vastly exceeds the capacity of existing program and contractor infrastructure... The need to scale up quickly will put tremendous pressure on the ability of non-profit and public providers to manage the program as effectively as they have done in the past. It will be too easy for the quality of training, service delivery, and program management to suffer as providers attempt to cope with the proliferation of contractors and training programs. Failure to address the low labor standards and limited career options that confront

most weatherization workers could also weaken the program's economic benefits and long-term stability."<sup>134</sup>

LIUNA put skin in the game. They mobilized their national training capacity through the Laborers Training and Education Fund, which runs 70 training centers across the country. They developed through the Fund new curricula for a residential retrofit workforce, with training programs and corresponding credentials for Weatherization Installer/Technician, Weatherization Supervisor, and Energy Auditor. In addition, LIUNA used its political strength in some states to advocate for the inclusion of language that spelled out job, training, and skill standards in WAP State Plans submitted to DOE.

To no one's surprise, LIUNA's effort presented a challenge to WAP, a program with a more than three decade-long track record, a network of Community Action Agencies (CAAs) that administer the program and contractors that have historically done the work, and no requirement that weatherization workers meet any skills standard or hold a skill certification.

We know of no survey that has systematically assessed the impacts of this effort to push a high-road training and skills agenda within WAP. We can point anecdotally to fruitful partnerships that were developed between CAAs and LIUNA locals. In Las Vegas, HELP of Southern Nevada (a CAA) and its contractors retrofitted 2,695 units over a 6-month period at the peak of WAP implementation, from mid-December 2009 through the end of May, 2010, more than doubling the agency's ARRA goal — 1222 units over a 12-month period — in half the expected time. Its biggest contractor is a signatory with LIUNA Local 872, which used its training infrastructure and new weatherization training programs to train its workers in weatherization skills, including new members for whom the training and jobs served as a pathway out of poverty. In addition, the local's hiring hall approach allowed the fast recruitment of new crews of trained workers whenever needed.<sup>135</sup>

But if anecdote is our guide, the authors of this paper have heard far more stories of resistance from WAP's

traditional service delivery stakeholders to efforts that would have required an implementation strategy different than the status quo. The experience in two states, Delaware (DE) and New Jersey (NJ), is instructive and sobering. In both states, LIUNA had strong membership, training centers, contractors, and political relationships. They were able to get agreements from state administrative agencies, which were written into the WAP State Plans, to include job and training standards, specifically requiring that: contractors pay for the health coverage of their workers and hire trainees from programs that serve low-income communities; and that workers meet competency/skill standards. In NJ, LIUNA also won an RFP from the state, under Governor Corzine, to train 600 weatherization workers.

However, these policy and contract victories at the state level did not translate into success on the ground. In NJ, the state association of CAAs expressed no interest in working with LIUNA. The 22 CAAs responsible for implementing WAP at the local level either performed the weatherization work themselves or subcontracted to their existing contractors, none of whom were signatories with LIUNA. Only in Newark did LIUNA develop a partnership with the local CAA, but that produced a minimal number of job placements. At first, the state tried to mediate the dispute between LIUNA and the CAAs, but as soon as Governor Christie took the helm, replacing Corzine, their support for the job standards disappeared. After training 100 of the planned 600 workers, and placing only 5 of them in jobs, LIUNA made a decision to discontinue the training and return the remainder of the RFP money to the state.

In DE, the story developed in a similar fashion, but the ending was different. As in NJ, there was resistance from the CAAs to the involvement of LIUNA training and contractors. But the implementation of WAP in the state was altered dramatically by a DOE inspection in 2010 that found contractor fraud and faulty work on numerous homes that were weatherized through the program. The weatherization program was shut down and, in the

resulting shake-up, administration of it was transferred from DE's Health and Human Services agency to its environmental agency. When DE re-booted the program, LIUNA Local 55 and their workers and affiliated contractors started getting jobs. By the conclusion of the WAP Recovery Act funding period in the spring of 2012, roughly 20 percent of WAP projects in DE were being carried out by LIUNA contractors and workers.<sup>136</sup>

This summary of efforts to implement the WAP using high-road strategies should not be mistaken for a complete and fair assessment of WAP and in particular its implementation of Recovery Act funds. Indeed, given the politicized and often inaccurate attacks on WAP from right-wing commentators and Republican policymakers, we should note here some of the successes of that implementation:

By December 2011, states, territories and tribes weatherized more than 600,000 homes, reaching this key milestone 3 months ahead of schedule.<sup>137</sup>

Participating households are projected to save more than \$400 per year on average by reducing their energy consumption up to 35 percent. This is critical in low-income households, which typically spend 14 percent of income on energy, as opposed to the national average of 3 percent.<sup>138</sup>

Each home weatherized will reduce annual CO<sub>2</sub> emissions, on average, by 2.65 metric tons.<sup>139</sup>

The efforts to drive an expanding home retrofit industry along a high road have by no means been limited to WAP and other Recovery Act funded programs. One of the most ambitious efforts occurred in Massachusetts (MA), where the Community Labor United-led Green Justice Coalition won a commitment from state policymakers to initiate four pilot weatherization programs as part of the state's three-year plan to retrofit 130,000 homes through MassSave, the state's utility-sponsored, ratepayer-funded

energy efficiency program. The Green Justice Coalition was able to secure a 'responsible contractor agreement' with the contractors for these pilots that included: a living wage and health benefits for workers; a "first-source" hiring commitment that encouraged recruitment of workers from low-income communities; employer-paid training for certain basic weatherization skills, and clearly articulated pathways for trainees into either apprenticeship programs in the building trades or employment within the energy efficiency or utility sectors; compliance with (i.e., no violations of) wage and hour and safety laws; proper classification of workers; and a labor peace or "card check" agreement allowing workers to organize a union without employer opposition.<sup>140</sup>

The four pilots were implemented in four different MA communities: Chelsea, Chinatown (Boston), Springfield, and Lynn. In all of the pilots, households earning 60–120 percent of the State Median Income were targeted. These were households with incomes too high to qualify for assistance from WAP, but still low enough to find it difficult to afford weatherization without assistance. Many were concentrated in immigrant communities and communities of color, which had historically underutilized the MassSave program. In each pilot community, a local CBO led the effort and was responsible for recruiting households for participation through extensive outreach.

Weatherization workers were trained in each of the pilot communities by union partners: LIUNA, the Painters Union, and the Carpenters Union. The training was 10 weeks in length; workers were trained for a full set of weatherization skills, and also received OSHA and lead abatement training broadly applicable to work in the construction sector. The training was tailored to address barriers presented by the trainees. For example, the Painters Union, for the first time, conducted bilingual training that was co-led by a Chinese-speaking trainer, providing monolingual Chinese workers with an entry point to an industry that was previously inaccessible to them.

And yet, despite innovative training, substantial state investment, participation and support from a range of partners, and remarkably comprehensive responsible contractor agreements, the pilots fell short in perhaps the most important measure of success: placing trained workers in jobs and careers. According to an evaluation done of two of the completed pilots, only one worker in Chelsea who graduated from the training program was hired by the contractor, and four workers were hired in Chinatown.

Two explanations for this disappointing outcome are worth emphasizing: first, even with gap financing available there were simply not enough home retrofit contracts “bundled” by community outreach to justify the hiring of new workers by the participating contractors (although enrollment targets were met in both communities); second, the protracted process of generating weatherization contracts resulted in a substantial gap in time between when trainees completed their 10-week program and when contractors could begin work on projects.<sup>141</sup>

In the final analysis, we should remember that the MA programs were pilots — no reasonable person had expectations of hundreds of jobs being created. But the experience there, and the example of LIUNA’s decidedly mixed success in NJ at placing the graduates of its weatherization training programs in jobs, illustrates a broader problem that has become particularly evident. Simply put, a mismatch appears to have been created between an over-supply of workers trained for jobs in weatherization and weak demand from employers for new weatherization workers. We can cite no nationwide analysis that confirms and quantifies this perception, but at this point the local and anecdotal evidence is overwhelming. Training program managers and advocates in different areas and labor markets across the country have described to us repeatedly the difficulties of placing graduates of weatherization/home retrofit training programs in jobs.

We can offer some reasons for the less-than-expected demand from employers. Certainly, as noted earlier, the failure to pass a comprehensive climate and energy bill or the HomeStar legislation froze any plans among contractors in the home retrofit industry to dramatically expand their business plans and hiring. In addition, challenges from federal regulators to PACE (Property Assessed Clean Energy) loan programs, one of the most promising strategies to enable financing of retrofits at the local level, effectively sabotaged plans developed by scores of municipalities to initiate or expand home retrofit programs into new markets beyond the income parameters of WAP and other federal subsidy programs.

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*Perhaps no industry has embodied the promise and perils of the green economy more completely than the home retrofit industry.*

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But these policy failures don't explain the disconnect between the jobs created in the residential energy efficiency sector over the last two years by the Recovery Act's massive investments (and significant additional investments from state- and ratepayer-funded programs) and the programs training workers to fill such jobs. So what explains this disconnect? We can hypothesize four reasons, some of them already suggested in the local examples provided above:

- 1) due to the collapse of the housing market and a correspondingly high unemployment rate in the construction industry (particularly residential construction), there was a surplus of trained workers "on the bench" and available to be quickly hired and put on the job by weatherization contractors;
- 2) in local labor markets where the pool of unemployed construction workers was insufficient to meet employer demand, or untapped for whatever reason, weatherization contractors, particularly those well established within the WAP program, either trained new workers on the job, or hired new workers from training programs with which they had some pre-existing relationship or affiliation, e.g., the 15 training centers across the country "verified" by the WAP Technical Assistance Center;
- 3) the lack of synchronicity between when jobs were created by Recovery

Act investments — which filtered through a process that involved allocation, implementation planning, and recruiting and completing contracts with homeowners — and when trainees completed training programs.

The fourth reason we offer requires more explanation:

- 4) There were too many new weatherization training programs created and publicly funded. We have no national count of training programs that were newly created over the last 2–3 years for occupations within the weatherization/residential energy efficiency industry. But we're confident in stating that the number is quite high and, more importantly, well in excess of any reasonable assessment of long-term employer demand in the industry and already established education and training capacity.

On this point, it's instructive to examine the Recovery Act's largest source of funding for green job training, the \$500 million Green Jobs Program (GJP) at DOL. Given considerable latitude on how to spend these funds, DOL issued grant solicitations for five separate programs. DOL received close to 1000 applications that met the requirements of the grants and ultimately awarded 189 grants across the five program areas in December 2009 and January 2010. Forty of those awards were for Pathways Out of

Poverty grants for programs that integrated training and supportive services to help low-income populations find pathways out of poverty and into economic self-sufficiency through employment in energy efficiency and renewable energy industries. In the solicitation, DOL, per the Green Jobs Act, had identified seven different industry sectors for which applicant training programs could propose to train workers, one of the seven being "energy-efficient building, construction, and retrofit industries."

However, of the 40 organizations awarded Pathways Out of Poverty funds, 38 listed some variation of the energy efficiency, construction, and retrofit industries as one of their, or their single, "industries of focus."<sup>142</sup> This is a striking percentage, particularly given the fact that in January 2010, when the awards were announced, the national unemployment rate in the construction sector was 24.7 percent. It's certainly possible that the high percentage of awards granted to programs with a building efficiency focus was representative of the applications received by DOL, and the ratio of hype and excitement to good labor market data available to applicants with regard to these emerging industries. Unfortunately, the sequencing of DOL's grant-making was of no help in mitigating any such ignorance in the field. The 29 grants awarded to states to conduct labor market



analysis on green jobs were issued only a month before the training grants were awarded, with the result that all of the analyses were completed well after the DOL-funded green job training programs were designed and had begun implementation.

The problem of too many training providers concentrated on one emerging industry sector was compounded in Detroit, Michigan, by the fact that three different organizations — Jobs For the Future (JFF), Southwest Housing Solutions, and SER Metro — received DOL grants to train workers (each targeting low-income or unemployed workers) for jobs in Detroit’s weatherization/building efficiency industry. In the case of the grant to JFF, the Detroit portion of which is administered by the Detroit Regional Workforce Fund, this oversaturation of training resources for too few new jobs forced the Fund to make a mid-course implementation correction when they realized that they wouldn’t be able to reach their job placement goals with a focus on weatherization training.

As a workforce intermediary with strong participation from employers and state and local economic development agencies, the Fund was able to examine a range of different industries to which it could quickly redirect its training dollars. The Fund identified the environmental remediation of buildings as a growth industry, for reasons that speak volumes (but we won’t, at least not here) about urban disinvestment and blight in the U.S.: large



sections of Detroit are designated as brownfield sites, the redevelopment of which requires cleaning up hazardous substances, pollutants, or contaminants. Since many of the tens of thousands of abandoned buildings in Detroit are located on these sites, well-trained workers are required to remediate them.<sup>143</sup>

DOL allowed JFF to modify the grant and switch training providers, subcontracting with Detroiters Working for Environmental Justice (DWEJ), which has a long history of training low-income, high-barrier Detroit residents for environmental remediation jobs. (Their motto: “You have to clean up before your green up.”) DWEJ’s training program is 11 weeks, the first 4 weeks dedicated to basic skills. The remaining weeks involve occupational-related training for a range of certifications necessary to get employment in the remediation industry: HAZWOPER, Lead Worker, and Asbestos Worker. The program also includes training on OSHA, deconstruction, confined space entry, and environmental site assessment.<sup>144</sup>

By June of 2012 DWEJ had placed — in related occupations — 66 of the 88 participants that had thus far completed their DOL-funded training.<sup>145</sup> In fact, we should pause here and consider some of the successes of the DOL’s Green Jobs Program as a whole, which, as with the WAP program, is necessary context in an era when Republicans in Congress are attacking any program with clean energy goals, particularly when such programs also serve low-income workers and households (clean energy, climate protection, and poor people constituting an irresistible trifecta of targets for the GOP). We argue here (with the considerable benefit of hindsight) that DOL over-concentrated training resources on an industry that couldn’t absorb many entry-level workers. But we also lift up examples elsewhere in this paper of efforts funded by the Green Jobs Program that are greening existing industries in significant ways.

By June 2011, when most of the funded green job training programs had been operating for less than a year, grantees had served more than 52,000 incumbent and unemployed workers. The majority of the 26,000 participants who had completed training by that time were unemployed at entry. Of those, 52 percent had found work, with 83 percent in the industry or occupation for which they trained.<sup>146</sup>

## THE SEED CENTER’S GREEN GENOME: SELECTIVE PRESSURE FOR COMMUNITY COLLEGE TRANSFORMATION

The American Association of Community Colleges’ Sustainability Education and Economic Development (SEED) Center is helping its more than 460 college signatories work toward whole systems thinking and action through a project called the Green Genome. Strategically integrating campus sustainability principles and practices, green-related technical workforce development, and economic development efforts, the project aims for broad impact — greening not only institutions, but communities. The Green Genome lays out four key

levers to drive institutional transformation at community colleges: program design and delivery, strategic partnerships, community engagement, and governance. Each lever incorporates a set of institutional competencies which, when achieved, indicate that sustainability principles have become part of a college’s “DNA.”

Though the project will in part drive change through a prize mechanism, project tools will be widely distributed. Together with the Los Angeles Trade Technical

But to return to the subject of workforce development in the home retrofit industry, and what we have learned over the last couple of years. The California (CA) experience in this area is particularly instructive, and an example of how state policymakers have incorporated lessons learned from both on-the-ground experience and systematic evaluations into policies and a policymaking process that, we believe, holds a lot of potential to positively impact the quality of jobs, quality of work, and career pathways in the residential efficiency sector.

CA has long been the national leader in energy efficiency, using policy as well public investment to realize efficiency gains and energy savings. The Recovery Act provided a big new funding source for energy efficiency, but one that added to an already strong base of state and ratepayer funds. CA policymakers already had significant experience with energy efficiency industries and markets, and had a long-term orientation to their development that extended well beyond the three-year spend-out of ARRA funds.

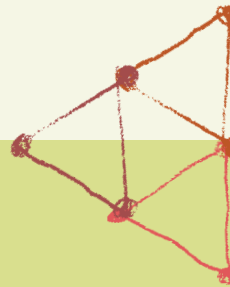
The influx of Recovery Act funds on top of already existing investments sparked concerns about a shortage of skilled workers in a range of clean energy industries. To address these concerns, the California Energy Commission's (CEC's) first use of ARRA State Energy Program funding went to support a Clean Energy Workforce Training Program to fund curricula development and different kinds of training programs for jobs in clean energy fields, with a particular focus on training the workforce necessary to deliver quality installations of energy efficiency measures in California's existing building stock. The Program emphasized the use of sector strategies to shape implementation and to that end funded over 50 partnerships involving Workforce Investment Boards (WIBs), training providers, employers, unions and other stakeholders across the state. However, the connection of training with employer hiring in building efficiency sectors hit two big snags: the blow-up of the PACE loan model — invented in CA — which had been expected to generate a large number of jobs, particularly in the residential efficiency sector; and a very long time lag between when training programs produced graduates and the state's ramp-up of its ARRA-funded efficiency programs.

College, the SEED Center has developed a **Green Genome Institutional Self-Assessment**. This free tool is designed for community colleges to gauge how well they may be leading related initiatives today, and where to prioritize investment in the future. For example, the assessment prompts a college to consider how effectively they are using labor market data to green their curricula; whether the institutional culture supports commitment to a “triple bottom line”; and what capacity the campus may have to engage in community sustainability efforts

(e.g. offer a speaker series to raise awareness and ultimately help drive local demand for greener products and services).

The Green Genome promotes critical cross-silo dialogue. In doing so, it can help colleges to better align green initiatives with strategic institutional priorities, making such initiatives themselves more sustainable. The goal, after all, is not a new project but a new and more organic way of doing business.

*For more information: [www.theseedcenter.org](http://www.theseedcenter.org)*



In 2011 the University of California Berkeley released the *Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response* — a massive and robustly documented piece of research commissioned by the California Public Utility Commission (CPUC) as a deliverable of CPUC's 2008 Long-Term Energy Efficiency Plan.<sup>147</sup> The Needs Assessment included an inventory of CA's existing workforce development infrastructure, which identified an “overabundance” of programs, spread and uncoordinated across multiple institutions, training workers in energy efficiency-related occupations. For example, the inventory counted 118 separate training program tracks for auditing and/or inspection of building efficiency. The Needs Assessment concluded:

“The quantitative analysis shows that, at least through 2020, concerns about shortages of new workers for energy efficiency and related work are unwarranted, particularly for the most prominent energy efficiency occupations... [However], concerns about shortages of jobs for graduates from education and training programs are real and likely to persist through 2020, particularly for those with less than four years of college. As a result, great caution should be used in considering the funding of new training programs. For achieving energy efficiency goals the focus should be on upgrading the energy efficiency skills and knowledge of the incumbent workforce.”<sup>148</sup>

The Needs Assessment also identified a high incidence of poor quality installation of energy efficiency measures and the limited prevalence of industry recognized skill certifications in related occupations. It recommended that CA emphasize both skills certifications for occupations within building efficiency-related occupations and employ other high-road strategies to improve job quality and work conditions in the industry.

These recommendations dovetailed with the implementation of AB 758, legislation passed by the CA Legislature in 2010. AB 758 requires the CEC to develop and implement a comprehensive program to achieve greater energy savings in CA's existing residential and nonresidential building stock. The legislation requires that comprehensive plan to include coordination with workforce stakeholders to create a sustainable retrofit workforce.

The combination of the state's early Recovery Act experience, the findings of the Needs Assessment, and the requirements of AB 758 led the CEC to begin using skills certification requirements as a policy lever to ensure higher quality work, better jobs, and more market certainty in the home retrofit industry. CEC has started to require that contractors using public funds to retrofit homes have a BPI-certified Building Performance Analyst on staff (although there are no analogous certification requirements for auditing or installation personnel); to ease the transition, CEC provided rebates to contractors to pay for the training. CEC has also inserted into the state's residential building code a requirement that the installation of certain energy efficiency measures in the most critical climate zones be quality checked by HERS-certified raters.

These policy reforms are hopeful signs of things to come. The AB 758 process will require a full assessment of the range of industry recognized certification that can be effectively used to help achieve the energy savings called for by the legislation. By the end of 2012, the CEC will make some very impactful decisions about the skills certification that will be required for building efficiency retrofits that receive state subsidies. Given the size of the CA economy, and the impact of market demand in the state on industry behavior, the implications of this policymaking process could be national.<sup>149</sup>

## Case Study 2

### GREENER EQUITY: BUILDING EMERALD CITIES

The experience of the USDOE Weatherization Assistance Program (WAP) under ARRA illuminates the critical importance of aligning signals between labor supply and demand. Efforts to stand up a poorly understood and relatively disorganized industry sector (residential construction) in a period of severe recession helped to generate the glut of training for — and subsequent reaction against — “green jobs.” But before writing off retrofits as a policy experiment gone bad, it is important to remember the capacity and potential of building energy efficiency writ large. Weatherization is a small subset of the residential energy retrofit market, which is itself a subset of building efficiency as a whole.

Non-industrial building stock consumes more than 40 percent of U.S. energy, making it the largest guzzler of any major economic sector, including transportation. According to recent estimates by the Rockefeller Foundation and Deutsche Bank, energy efficiency retrofits in the U.S. across residential, commercial, and institutional building stock could yield:

- \$1T energy savings over 10 years
- 600M metric tons of CO<sub>2</sub> mitigation per year (reducing CO<sub>2</sub> emissions by 10 percent)
- 3.3M new direct and indirect cumulative job years<sup>155</sup>

It is beyond the scope of this paper to discuss the political leadership and financial innovation required to fully scale U.S. building retrofits. But we can highlight one more promising effort to leverage the requisite capital (social, financial, etc.), build demand on the local level, and respond to it in ways that serve workers and their communities. Because the point of energy efficiency is not simply better (warmer, brighter, more affordable, and less carbon-intensive) bricks and mortar. Done properly, it can be a mechanism for more equitable economic development.

This is the aim of the Emerald Cities Collaborative (ECC), a national effort of leading community organizations, labor unions, and businesses to green America’s cities, build and strengthen communities, and animate democratic participation. ECC, co-created by COWS, was founded as a way to capitalize on the new opportunities presented in 2008 — by a new Administration apparently committed to greening the economy and reducing inequality — for cities to pursue high-road development strategies.<sup>156</sup> In its 10 initial member cities (Seattle, Portland, Oakland, San Francisco, Los Angeles, Milwaukee, Cleveland, Providence, New York, and Atlanta), ECC is focusing first on catalyzing large-scale energy efficiency building retrofit projects, and ensuring that the jobs created are good (meeting minimum labor standards in terms of training, wages, benefits, etc.) and available to members of local communities.

That large-scale energy efficiency retrofits of buildings create jobs and save money is not controversial. However, in few places have such programs been implemented at anything approaching their potential scale. This is due, in part, to a lack of political leadership, constrained capital, the significant complication of these projects, and uncertainty about the value proposition. ECC’s challenge is to overcome these hurdles — simplifying the process and connecting the players to build a market. Local Emerald Cities councils work to do so initially by building demand for these projects. ECC’s core membership constituencies — community groups, organized labor, business, and local philanthropy — are not accidental. This coalition has the necessary political clout to make projects happen, by convincing, and then working with and supporting local government to develop projects.

All parties recognize that without the political support this coalition can create, energy efficiency projects are unlikely to happen at significant enough scale to create the desired jobs and work. Indeed, economic and political

crises, while straining many coalitions, have also facilitated partnership-building. Unions face demographic challenges and political threats to their very right to exist; even with a significant proportion of membership on the bench, labor recognizes the need to expand and diversify its base. Community support means survival, if not power. Low-income communities of color, facing rising inequality and the decline of traditional (e.g., manufacturing, public sector) pathways to the middle class, need more access to decent jobs and the paid training to do them. These are usually delivered, at least in the construction sector, by the building trades. Both groups (though neither is by any means homogeneous or even internally united) see potential job creation and opportunity in a clean energy economy, and, to some extent, the logical advantages of joining forces to build it. This mutually beneficial partnership is the core of the ECC project.<sup>157</sup>

A labor and community partnership, supported by relevant businesses and backed by philanthropy, forms a strong constituency to work with elected leaders to make projects happen. ECC's 10 local councils, composed of representatives from each of these key groups, work as market intermediaries in the cities, brokering deals, connecting property owners with financing, and making sure that resulting jobs are high quality and accessible to local workers. This process frequently involves a negotiated community workforce agreement (CWA), stipulating worker training, targeted hires, preferred training providers, and minimum worker certifications.

The local councils are supported by the national organization, composed of a small staff and several committees of volunteers from national collaborative members. These national bodies set the overall direction of the organization, develop policy, coordinate joint advocacy, and assist local councils with fundraising. The national body provides training to local councils, funds some staff, and provides project-based technical assistance to make deals happen.

Some of the best work in human capital development, green and otherwise, lies in partnerships, often brokered by an intermediary that can translate effectively between supply and demand sides of the labor market, aligning education and training, industry demand, and workers. In this tradition, Emerald Cities is attempting to coordinate place-based high-road partnerships that link green economic development, labor unions, and marginalized communities.<sup>158</sup>

The approach seems to be working. San Francisco recently signed an ECC deal to retrofit 270 units of public housing, and is already pursuing financing for a second round, adding 45 properties and 1323 new units to the program — all governed by a CWA. Seattle's ECC has spurred direct investment of more than \$20 million from public and private sources in the retrofit of several MUSH (municipal/government, university, school, and hospital sector) facilities, work covered by a CWA. ECC is also nationally pursuing retrofits of community college campuses — currently 23 have signed on to the ECC Community College Sustainability Initiative. ECC Portland is mapping regional training and occupational pathways for the construction industry, and working to better integrate the community-based pre-apprenticeship pipeline with union and other contractor demand on the \$133 million retrofit of a key federal building.

### Case Study 3

## PROCESS VS. PRODUCT: GREENER MANUFACTURING

It's now well recognized that a clean energy economic transformation holds tremendous promise to revitalize the U.S. manufacturing sector, after decades of plant closings and job losses that have hit certain regions of the country, like the Midwest, particularly hard. The logic of this promise is straightforward: it simply takes more work to manufacture the sources of our energy than to drill and mine for them, or import them from other countries.

This transformation is already occurring, although it's threatened by inconsistent and insufficient federal policy support. According to the Brookings Institution's *Sizing the Clean Economy* report, the U.S. manufacturing sector accounts for 26 percent of the country's 2.7 million clean economy jobs, compared to 9 percent in the overall economy.<sup>159</sup> In the wind sector alone the supply chain of manufacturers now consists of 400 facilities spread across 44 different states.<sup>160</sup>

However, the increase in U.S. manufacturers' production of technologies and component parts that meets market demands for renewable energy and energy efficiency products (or for products related to environmental protection, e.g. pollution control) has not translated into a corresponding need for a set of discrete manufacturing skills related specifically to the manufacture of those products. Indeed, most green jobs in the manufacturing sector meet the definition developed by O\*NET for "Green Increased Demand Occupations": "The impact of green economy activities and technologies is an increase in the employment demand for an existing occupation. However, this impact does not entail significant changes in the work and worker requirements of the occupation. *The work context may change, but the tasks themselves do not.*"<sup>161</sup> In other words, a CNC operator can use the same set of skills to cut steel for a wind turbine tower and an armored vehicle. The products are different (not to mention the policy decisions that create greater market demand for the latter than the former), but the skills are not.

But there's another dimension to green manufacturing, which is to make the production process — in all manufacturing sectors — greener. The Manufacturing Skill Standards Council (MSSC) — an industry-led, training, assessment and certification organization — defines green production as: "workplace activities across all industries within the manufacturing sector that require the use of equipment, technologies, and processes that will improve the environmental performance of manufacturing companies."<sup>162</sup>

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*The increase in U.S. production of technologies and component parts for renewable energy, energy efficiency, and environmental protection has not translated into a corresponding need for a set of discrete manufacturing skills.*

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It's this set of activities, and the new skills and skill standards they require, that has become the focus of green workforce development in the manufacturing sector. It's a focus that has been driven by the industry itself. In 2009, the Manufacturing Institute, a non-profit affiliate of the National Association of Manufacturers, began an ambitious effort to develop a set of nationally portable, industry-recognized manufacturing skills certifications. They decided to build on the foundation laid by the Advanced Manufacturing Competency Model (AMCM) developed by DOL and leading industry organizations, first released in 2006.

However, in the Institute's judgment, the AMCM was outdated in one key respect: it included nothing on competencies related to green and sustainable practices in manufacturing. To the Institute, the need to do 'more with less' was the line connecting lean to green in manufacturing. This orientation is reflected in the Institute's framework for analyzing structural costs in the manufacturing sector: both 'energy costs' and 'pollution abatement' are categorized as central cost factors and subject to bottom-line attention in the same way that taxation and benefit costs are considered. In this framework, then, skills to address these kinds of structural costs should be treated as a core competency of the manufacturing workforce. DOL agreed and modified the AMCM to include a "Sustainable and Green Manufacturing" block of competencies, situated primarily in entry-level critical work functions and entry-level technical content areas.<sup>163</sup>

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*But there's another dimension to green manufacturing, which is to make the production process – in all manufacturing sectors – greener.*

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On a parallel track, MSSC led industry efforts to codify skills certification consistent with the updated and greened up competency model, building on a foundation already laid. MSSC had established a Certified Production Technician

(CPT) skill standard and a related curriculum designed to align with that standard. The CPT certifications were divided into four modules, each representing a set of critical work functions: Safety; Quality Practices & Measurement; Manufacturing Production & Processes; and Maintenance Awareness.

In 2010, MSSC began work on adding a fifth 'green' module to the existing four CPT certificates, with funding support from the DOL Energy Training Partnership grant (one of the ARRA-funded Green Jobs Program grants).



MSSC developed a “Green Production Module” (GPM) as part of a partnership with the IUE-CWA union that also included a pilot program to train front-line manufacturing workers in Ohio in the first four CPT modules and then the GPM once it was finalized.

To develop the GPM, MSSC went through a validation process with over 60 companies, attempting to represent every sector of manufacturing as they developed the work standards that would serve as a framework for assessment. MSSC started with 10 activity areas for the GPM and dropped down to 8 as a result of the validation process. The final Module includes training in and skill standards for: conservation (e.g., energy, water, energy-efficient materials, use of recycled materials in products); emissions reduction and purification (e.g., of waste, air, water, gas, chemicals); renew-ability, recycle-ability, and final disposal of products to maximize the lifecycle efficiency of the resources, raw materials, products, and processes involved in manufacturing; and regulatory compliance and environmental assurance. MSSC estimates that GPM training should take 35–40 hours; it can be delivered online or in the classroom.<sup>164</sup>

IUE-CWA was a year and a half into the implementation of the DOL grant, in which they trained hundreds of dislocated workers in the Dayton and Cincinnati areas in the four traditional CPT modules, before the GPM was ready to use in the summer of 2011. IUE-CWA then ran more than 200 dislocated workers through the pilot GPM training between August and December of 2011.<sup>165</sup> Of the 239 participants enrolled to date, 210 completed the course, and 80 gained employment.<sup>166</sup>

The initial phase of the MSSC green production program seems promising. Nearly 350 individuals from seven states — including the 200-plus front-line Ohio workers — took part in the training, and 280 green credentials were awarded to participants. Overall, the Ohio credentialing program, including traditional and green modules, exceeded every goal set by MSSC: they

issued more than twice as many credentials overall as projected, including 422 full CPT certifications; the passing rates for the project (87 percent–96 percent) were higher than the national average for MSSC assessments (82 percent); and the number of job placements (425) exceeded the goal set for the grant. As evidence of project sustainability, MSSC notes that more than 30 companies in the region now prioritize the CPT credential when hiring. And their Cincinnati team, following the end of the formal grant period in January, has continued the effort, working with more than 200 dislocated workers.<sup>167</sup>

The take-up of the Green Production certification is potentially big, given the national reach of the MSSC, the more than 200 community colleges across the country that are already training students on the first four CPT modules, and the employers who increasingly view the CPT as a trusted, go-to skill standard for assessing front-line production workers. (Employers have repeatedly told IUE-CWA trainers that a job applicant with a CPT certification jumps to the front of the line when decisions about hiring are made.)

Whether that take-up is big or small depends on a number of factors. Two of the most important are **1)** how vigorously MSSC promotes the GPM as a part of its overall CPT package rather than as a separate add-on module; and **2)** how effectively it can be demonstrated that workers with the GPM add value to manufacturers, and in concrete ways. Regardless, what’s clear already is that the GPM green certification, built on a CPT certification that is quickly becoming the industry-recognized standard, couldn’t be better positioned to become the skills standard-bearer for green manufacturing.<sup>168</sup>

### Case Study 4

## NOT NECESSARILY GREENER ON-RAMPS: BRIDGES TO MANUFACTURING CAREERS

A more sustainable future demands that we build a greener economy, based in part on advanced manufacturing for clean energy industries. As the MSSC case demonstrates, greener manufacturing is as much about process as product, at least in terms of skills required. And as the CEWD case points out, one of the challenges is getting workers over basic skills hurdles into increasingly technical careers. In each case, specialization — in particular an occupationally-specific layer of “green” skills or knowledge — may not come until well down the path of occupational training. So the on-ramp to a greener career may in fact involve little to no greening at all.

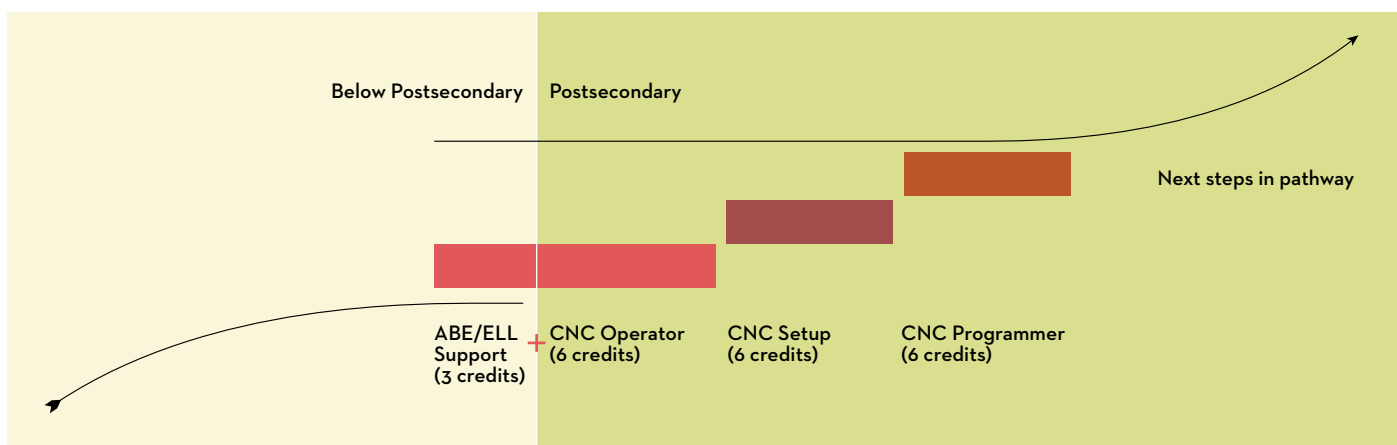
Indeed it is the access not the greenery that determines sustainability here. For the 90 million Americans with no credentials beyond high school, unprepared to enter either technical occupations or the first rung of post-secondary education, the paths that lead to training,

credentials, and decent jobs, green or otherwise, are too often confusing and inhospitable.<sup>169</sup>

Technical colleges and the public workforce system in Wisconsin have helped to lead a national effort to connect more low-skilled, low-income working adults with post-secondary credentials that pay off in the labor market. As part of the Joyce Foundation’s Shifting Gears Initiative in five midwestern states, Wisconsin’s Regional Industry Skills Education (RISE) initiative promotes career pathways and related bridges — or on-ramps — in key industry sectors, including the region’s traditional backbone, manufacturing. Career pathway bridges combine basic skills instruction (things like math concepts, literacy, and language skills) with college-level coursework, reducing the time needed to achieve a post-secondary credential and accelerating career advancement for those who need it most.<sup>170</sup>

figure 11

### CAREER PATHWAY BRIDGE



The Western Technical College (WI) Career Pathway for CNC Machinists includes three stacked certificates that continue into a one-year technical diploma or an Advanced Manufacturing Applied Associates Degree. The first certificate is a bridge that blends basic skills instruction and college credit courses.

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*For the 90 million Americans with no credentials beyond high school, unprepared to enter either technical occupations or the first rung of post-secondary education, the paths that lead to training, credentials, and decent jobs, green or otherwise, are too often confusing and inhospitable.*

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A good example, and one which carries us beyond the abstract language of pathways, partnerships, and workforce development, is the CNC Skills Institute at Western Technical College in LaCrosse, WI.<sup>171</sup>

Over the past decade, key manufacturing employers in western Wisconsin have reported increasing need for workers that are skilled in computer numeric control (CNC) operation, setup, and programming. Despite this clear demand, Western Technical College has had difficulty attracting individuals to participate in CNC instruction. Until recently, Western only provided structured one- and two-year technical diploma programs in this field. Unfortunately, these diplomas are out of reach for many individuals who could benefit from such training. La Crosse's large Hmong community, for example, has been mostly relegated to low-wage employment, due in part to language and cultural barriers as well as a lack of high school credentials.

In an effort to increase awareness of opportunities in CNC/Machine Tool occupations and to provide manufacturing skills to more English language learners, Western offered one-credit Basic Machining Skills classes to Hmong participants in 2007 and 2008. These classes were team-taught by a CNC/Machine Tool instructor and a Hmong interpreter who was a Machine Tool program graduate. The experience was positive for the participants and the instructors, laying a foundation for continued collaboration and learning between Instructional Support Services and Western's CNC/Machine Tool department.

Building on this experience, Western developed the CNC Skills Institute in 2009 to help meet area employer demand as well as the needs of lower-skilled learners. Although it was designed with the region's Hmong population in mind, Western discovered during the recession that the Institute provided a good option for many non-Hmong dislocated and underemployed workers, as well as incumbent workers. Two of the students who enrolled in the pilot Bridge in Summer 2009 were incumbent workers sent by their employer.

The CNC Skills Institute comprises three tiers of instruction along a career pathway: CNC Operator, CNC Set-Up, and CNC Programming (*figure 11*). Each tier (a package of six one-credit courses) can stand alone as individual certificate courses of study, tier into higher levels of study, or be transferred into a one-year CNC/Machine Tool Operation technical diploma.

The first certificate level, which prepares participants for careers as CNC machine operators, provides foundational skills for many other manufacturing occupations in addition to machining. Western designed its CNC Skills Institute to integrate Adult Basic Education (ABE) into the delivery of the first tier's technical training. This design was based on extensive input from area employers regarding skills deficiencies in math and print reading for both incumbent and new workers. Manufacturing Math and Blueprint Reading are team-taught by an ABE instructor and a core technical CNC program instructor. In addition to the integration of basic skills instruction

into key components of the curricula, Western has included the use of video training and computer simulations in the first and second tiers of the CNC Skills Institute to aid English Language Learning (ELL) students with visual conceptualization.

Outcomes from the initial pilot of the CNC Skills Institute (Tier 1, CNC Operation) held in Summer 2009 showed great promise. Of the 13 students who participated, nine students successfully completed the course and received their certificate (two of the four students who left the program did so because they became employed in the field). All graduates of the first cohort took the Manufacturing Skills Standards Council (MSSC) Safety test and passed. Two of the graduates of CNC Operation enrolled in technical diploma programs at Western, and three others are interested in continuing their education in CNC/Machine Tool Technology, either by continuing with the next tier of the Skills Institute or by enrolling in a diploma program.

Because there was so much interest in the CNC Operation course, particularly from dislocated workers in the area (11 of 13 participants in Summer 2009 were dislocated workers), but not enough space or equipment, Western Technical College offered<sup>173</sup> the course again in Fall 2009. Twelve new students successfully completed the training in Fall 2009, obtained their CNC Operation certification, and registered for further instruction.

Western Technical College paid close attention to demand from area manufacturers. Staffing might require 10–20 Operation Technicians for every one to two Set-Up and Programming Technicians, and Western structured the delivery of the CNC Skills Institute Tiers with this in mind. Since Spring 2010, Western Technical University has offered the CNC Operation course twice more (Fall 2010, Spring 2011), bringing the total number of completing cohorts to four. In total, 20 of 25 students enrolled in the Fall 2010 or Spring 2011 courses obtained their certification in CNC Operation. Student success in CNC

Set-Up (Tier 2) was just as impressive. In its two offerings in Spring 2010 and Spring 2011, 19 students obtained certifications of 25 total enrolled in the two semesters (10 of 13 in Spring 2010; 9 of 12 in Spring 2011). Outcomes for the final module of the CNC Skills Institute, CNC Programmer (Tier 3) appear to match the lower demand and possibly increased difficulty of this module. The college offered it only twice — Spring/Summer 2010 and Spring/Summer 2011. The first was cancelled due to low enrollment; the second had twelve completers, but yielded only four certifications.<sup>172</sup>

Western's CNC Institute was part of a three-year, \$2M Community Based Job Training Grant from USDOL that began in 2009, and included Welding and Industrial Maintenance Skills Institutes. Additional manufacturing bridges — funded from a variety of sources — have been developed successfully elsewhere in the Wisconsin system, including CNC Operator programs at Gateway Technical College (a 3-semester program that includes GED preparation); and a shorter boot-camp model (8–16 weeks) at Waukesha County Technical College.<sup>173</sup> The latter in particular demonstrates one of the advantages of career pathway bridges: flexibility. They are not necessarily offered continuously, but designed to come online when there is sufficient demand in the regions served by these colleges.

If manufacturing continues to rebound — and has a chance to respond to the production needs of a growing clean economy — Wisconsin's CNC bridges offer an excellent model. And where combined with cleaner and more efficient process at high road firms, they offer a profoundly greener vision: helping low-skill workers advance while delivering the technically proficient workers critical to a U.S. manufacturing renaissance.

### Case Study 5

## GREENER TRANSMISSION: UTILITIES, GRIDS, AND CLEAN ENERGY TRAINING

Any claim that the electric utility industry in the U.S. is an integral part of the green economy requires some explanation. After all, of the total electricity delivered by utilities to U.S. homes and businesses, only 13 percent of it comes from renewable resources (*figure 12*).<sup>174</sup> And electricity generation accounts for 34 percent of the greenhouse gas pollution in the U.S., the largest from any economic sector.<sup>175</sup>

Despite the sobering reality of how we produce and consume electricity currently, any clean energy transformation in the U.S. economy has to run through the transmission lines and substations of the utility sector. In particular wind and solar, which will have to be scaled up dramatically, are dependent on the transmission capacity of the electric utility sector, given that the best sources of this energy are concentrated in areas far away from the

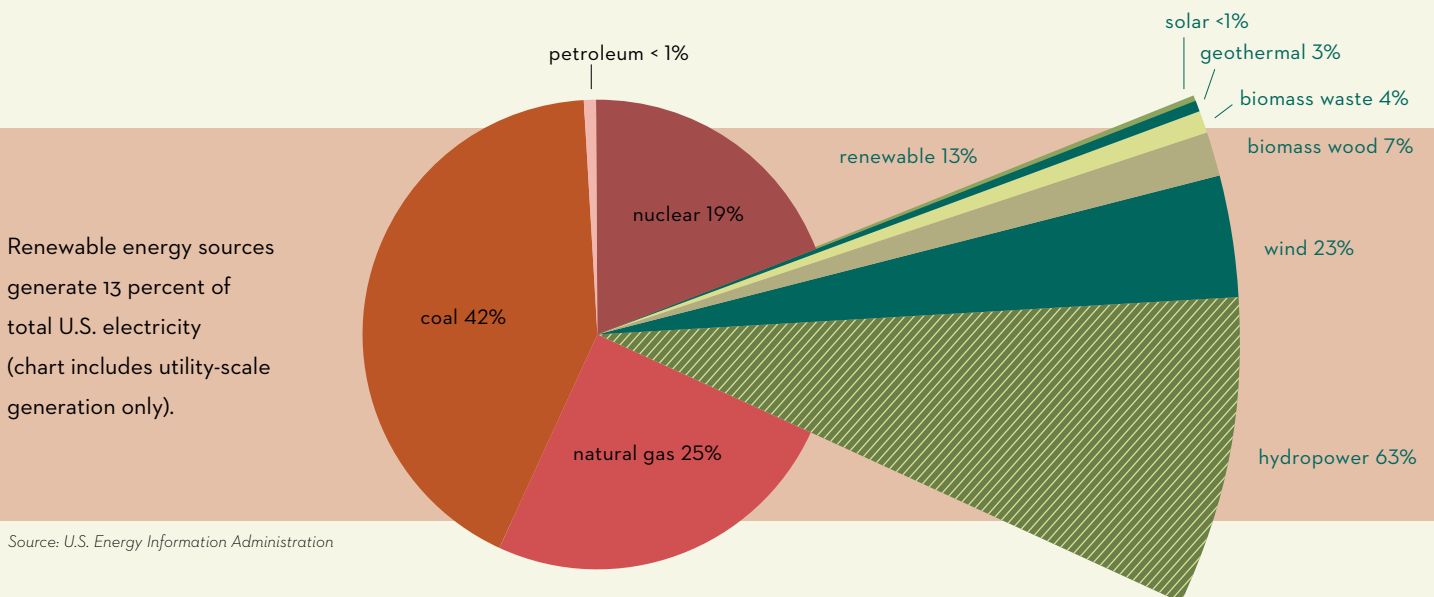
nation's biggest population centers, and will therefore have to be carried to these centers by new transmission infrastructure.

In addition, the electricity utility sector is increasingly using enabling technologies, often referred to collectively as the “smart grid,” that will advance energy efficiency, while also facilitating the deployment of renewable energy sources and distributed generation. Smart grid technologies will be particularly essential to any large-scale transition to electric vehicles: owners of plug-in hybrids will charge their vehicles at home, ideally at off-peak hours, and also send electricity back to the grid at needed times — all of which requires two-way, real-time communication between utilities and their customers.

But no renewable energy-powered electric utility sector (or dirty energy-powered utility sector, for that matter) will be possible without trained line workers, relay technicians, or electricians to build and maintain our utility infrastructure. Unfortunately, it's not a foregone

*figure 12*

### SOURCES OF ELECTRICITY GENERATION, 2011



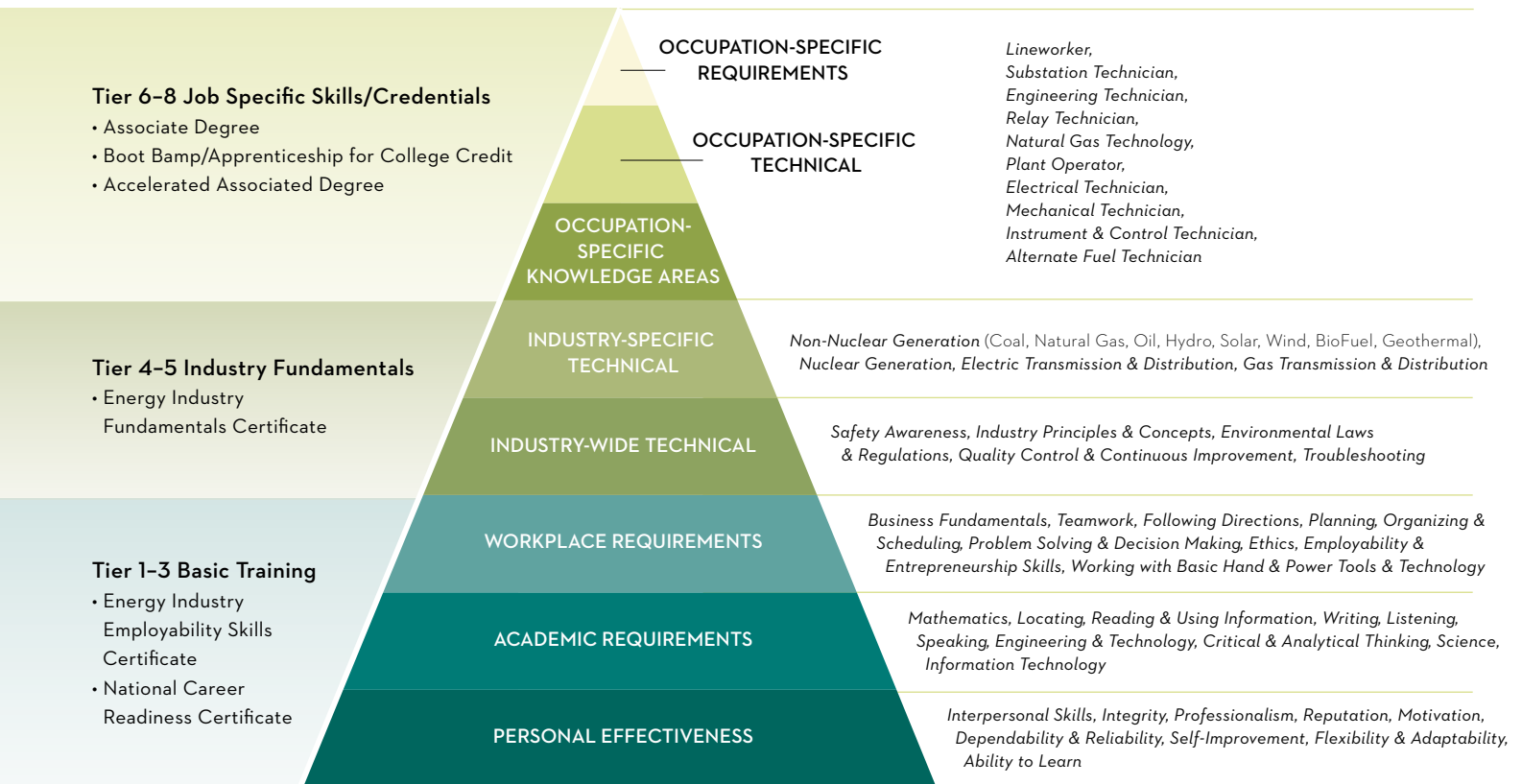
Source: U.S. Energy Information Administration

conclusion that there will be a sufficient supply of skilled workers in these occupations to meet status quo demands, let alone demands required by a national clean energy transformation. An estimated 46 percent of the utility industry workforce (approximately 200,000 workers) may need to be replaced by 2015, in large part due to baby boomers reaching retirement age.<sup>176</sup> The most critical occupations that will require replacement workers are engineers in all disciplines, particularly power engineers, and skilled utility technicians, including line workers, generation technicians, and transmission and distribution technicians.

The first responder to the projected workforce gap in the utility industry is the Center for Energy Workforce Development (CEWD), a non-profit consortium of utilities and their associations, contractors, and unions that was formed in 2006 to develop solutions to this looming shortage. CEWD is a national organization, but most of its work is guided by state energy workforce consortia which involve an analogous state partnership of CEWD's national stakeholders. Consortia have been formed in 28 states, where they each develop a state plan for meeting the needs of the utility sector and its workforce, a plan built upon an assessment of current and

figure 13

**ENERGY INDUSTRY COMPETENCY MODEL**



The Center for Energy Workforce Development's eight-tier competency and credentialing pyramid establishes a common skills framework for the electric utility industry. Note that training related to specific "green" technologies does not appear before tier five.

Adapted from Center for Energy Workforce Development

future energy workforce needs and the identification of any gaps in training.

CEWD has developed a strategic framework with four areas of focus to guide its work and that of its state consortia, branded as the Get Into Energy Career Pathways Model:

**CAREER AWARENESS** targets specific populations of workers for recruitment to the industry

**EDUCATION** includes a competency model and a system for industry credentialing

**WORKFORCE PLANNING** involves conducting annual workforce surveys to identify gaps in the workforce and in the skills of job applicants

**STRUCTURE AND SUPPORT** develops partnerships at both regional and national levels to align, leverage and coordinate resources and services.<sup>177</sup>

It's worth getting into the details of the first two of these focus areas.<sup>178</sup> The **Career Awareness** focus acknowledges that the utility industry needs to do a far more intentional job of recruiting workers from groups who heretofore have been under-represented among the ranks of the industry's workforce. It also acknowledges that different groups at particular stages in their lives might be open to exploring utility industry careers. CEWD's career awareness efforts therefore target specific groups for recruitment: young adults, veterans, women, adults in 'career transition' (to dispense with euphemism, this typically means dislocated and unemployed workers) and workers interested in engineering.

CEWD's approach is premised on the idea that each of these targeted groups will need different kinds of information and resources, as well as different kinds of strategies and supports to place individuals on the starting line of a pathway into the industry. So while CEWD has developed a website ([www.getintoenergy.com](http://www.getintoenergy.com))

that offers information and branded materials designed for each of the target groups, its state energy workforce consortia also coordinate extensive career coaching that involves staff from WIA One-Stops, community colleges and secondary schools, depending on state needs and the targeted group.

Career coaching and other career support services are particularly important for young adults who are low-income and often constrained by barriers to employment. In recognition of the challenges involved in recruiting individuals from this group and allowing them to succeed, CEWD has started pilot programs in 8 states (with funding from the Gates Foundation) that are geared to assess and guide these young adults (ages 16–26) into career pathways in the industry.

In its **Education** area of focus, CEWD's objective is to clearly link industry-recognized competencies and credentials to employment opportunities and advancement in the industry. CEWD's systematic approach dates from shortly after its inception, when it partnered with subject matter experts and the U.S. Department of Labor (DOL) to develop a common set of competencies for Generation, Transmission and Distribution occupations. This effort was galvanized by a recognition that existing education programs across the nation were not based on common competencies and industry requirements, such that graduates of a program in one area of the country were not qualified for related jobs in another part of the country.

CEWD's "Energy Competency Model" breaks down competencies into eight separate tiers, from very basic life skills (Tier 1 — Personal Effectiveness) to specific job skills (Tiers 6–8 — Occupation Specific).<sup>179</sup> CEWD has also developed an industry credentialing framework of stackable credentials that correspond with the tiered competencies. The goal is for these credentials to become the industry standard, recognized and used by all stakeholders (*figure 13*).<sup>180</sup>

CEWD has been particularly focused on Tiers 1 through 3 of the Competency Model, where the biggest skill deficits are identified by employers among the populations

targeted for recruitment to the industry. In a CEWD survey, utilities reported that 30 to 50 percent of applicants (meeting minimal requirements for a position) were unable to pass the pre-employment tests; the single biggest factor was the inability to perform basic math calculations.

For basic skills training, CEWD uses ACT's WorkKeys System, which assesses academic and work readiness skills; achievement of competencies results in ACT's National Career Readiness Certificate (NCRC). Based on ACT's occupational profiles for energy-related jobs, CEWD determined that a silver-level NCRC is an appropriate measure of attainment of the basic skills identified in the first three tiers of the Competency Model, indicating that individuals are prepared to enter training for a range of skilled technician occupations in the industry.

Correspondingly, CEWD has developed, and state consortia have implemented, different "boot camps," that train target populations in the fundamental competencies while preparing them for more technical training, ranging from (the self-explanatory) 'math boot camps' to 'line worker boot camps,' which combine basic skills training with basic information about the industry and requirements for the line worker position, and training for climbing and safety certificates and a commercial driver's license.

Individuals who have achieved the basic competencies can then use them as a foundation to move on to learn industry-wide and then occupation-specific skills, which in turn map to associated credentials. It is only at the highest occupation-specific tiers that skills related to renewable energy or energy efficiency are relevant. CEWD has divided competencies in these tiers into eight occupational categories. Reflecting the current make-up and demands of the industry as a whole, only one of these categories, termed 'alternative fuel technicians,' which encompasses occupations like wind turbine technicians and solar thermal installers, would be considered uniquely green (and once more for emphasis: unique

only at the occupation-specific level; they share basic, technical, and industry-wide competencies with all other workers in the industry).<sup>181</sup>

At the same time, however, workers in all of the occupations will have to become familiar with new technologies that reflect the stutter-step greening of the industry. An effort that reflects this trend is a sectoral partnership led by the Washington State Center of Excellence for Energy Technology, based at Centralia College, which includes several utilities, the International Brotherhood of Electrical Workers (IBEW), representing workers at the those utilities, other education and training organizations, WIBs, the Bonneville Power Administration, and a local economic development agency. The partnership applied for and won a \$5 million ARRA grant from the U.S. Department of Energy (DOE) for a project to deliver smart grid training for utility workers in a five-state region of the Pacific Northwest. The occupations trained for include instrument control and relay specialists; generation, load and substation operators; line workers, substation wiremen and mechanics, ground crews (utility construction workers), meter technicians, and customer service representatives.

The project will develop skill standards for occupations that do not have standards or apprenticeships already associated with them.<sup>182</sup> Interestingly, the first skill standard in development is for customer service representative — not an occupation that many would consider in need of a skill standard. However, the household applications of smart grid technologies are new and complex, and have generated concerns regarding health and privacy issues. Consider the smart meter: a technology that customers can potentially use to better manage their energy use — but only if they understand how to use it; and a technology that has generated a consumer backlash in some parts of the country by provoking a grab-bag of fears, stemming from (to offer just two examples) the radiation it purportedly emits and the Orwellian totalitarian state that it purportedly heralds.



Early experience in the Pacific Northwest suggests that existing customer service reps don't have the skills or capacity to deal with these kinds of challenges. One utility in the project area that has already installed smart meters reported 18 of their 200 reps are out on stress disability.

The second skill standard that the project plans to develop is for the meter technician occupation. There are two points worth emphasizing here. First, the frequently made argument (we make it ourselves) about the job creation potential of the green economy, due to the labor intensity of the work involved (and other factors) is not universally applicable. Sometimes, new technology deployment destroys jobs. While there have been some (wildly) optimistic projections of jobs created by investments in the smart grid, it's indisputable that some of the technology replaces human labor. Where smart meters are installed, the meter reader becomes an occupation of the past. Second, rendering obsolete the meter reader occupation should not translate into making the workers who have spent their careers reading those meters obsolete. The second point is a principle that guides the smart grid workforce project. The goal is to retrain 200 meters reader as meter technicians and re-deploy them across the region. Exactly what kinds of skills the utilities will require from these new meter techs is the impetus for the skills standardization and curriculum development process that they're undertaking.<sup>183</sup>

On the whole, the smart grid workforce project — like the CEWD Competency Model — illustrates how green job training consists primarily of layering green skills on a foundation of existing skills, in this case skills associated with smart grid technology laid on top of the set of skills that are foundational for different utility occupations. In effect, the smart grid requires the intersection of information technology (IT) skill sets with electronic technology skill sets. Substation operators are one example: traditionally everything in substations is operated manually; a smart grid allows much of the substation to be automated and operated electronically. Therefore,

the project's training involves instructing workers in how to perform certain tasks by computer rather than by pulling switches.

Getting smart grid training right will be a challenge. But as challenges go, it probably takes a back seat to the over-arching challenge that CEWD is trying to address: getting a substantial number of new workers into utility industry jobs. On this front, the good news is that the utility industry has well-defined pathways into quality jobs and careers that involve education and training organizations with a commitment to ensuring that each step in the career pathway is articulated to the one ahead of it and ultimately to a job at the end. The challenge is that skills requirements for entry into training and for the jobs themselves are quite high, making it difficult for workers with low basic skills and other barriers to take the first steps of the pathway.

An example from the smart grid workforce project illustrates this dynamic. One of the utility partners in the project, Avista, which serves customers throughout the Pacific Northwest, runs with Spokane Community College a four-month pre-apprenticeship training program for linemen, the Avista Lineworker Program (ALP). ALP is a partner in CEWD's nine-state effort to recruit low-income young adults to the industry. The program is working with high school counselors and WorkSource (WIA One-Stop) centers to recruit trainees. ALP is also partnering with the organization Women in Hard Hats to target women for recruitment.

ALP offers three classes per year. A class with 46 students started in January 2012. There were 400 applications for this class, from which 200 applicants were invited to interview, before the cut to 46 was made. The almost 10:1 ratio of applicants to accepted trainees is a reflection of the fact that standards for getting into the program are high, particularly with regard to math skills. For example, applicants have to pass an Algebra 2 test to be considered for program entry. This is a very different standard for entry compared to most pre-apprenticeship programs in

the construction sector, which typically accept students at lower skill levels and then focus their training on basic skills remediation, with the goal of getting those skills to a level at which students can pass an exam for entry into apprenticeship programs. In contrast, ALP teaches more occupational skills than basic or life skills. They learn how to set and climb poles, install crossarms, hardware, line, and transformers, and how to use all the tools of the trade. ALP has integrated smart grid skills into the curriculum with a 4-6 hour training module that includes an intro to smart grid applications, including components in a mock training substation that students train on.

In effect, then, ALP is both a pre-apprenticeship and entry-level utility training program. Historically, about 80 percent of its graduates are placed in the utility industry. Roughly half of the placements are directly into apprenticeship programs or to ground worker positions (essentially construction work on utility sites) that leads to apprenticeship (6 months of ground work required before entry). The primary apprenticeship program partner is the Northwest Line Construction Joint Apprenticeship and Training Committee (JATC), run by the IBEW and the National Electrical Contractors Association. Linemen first-step apprentices make over \$26 per hour with benefits; wages increase as apprentices advance, as part of a predefined scale negotiated between IBEW and its contractors.<sup>184</sup>

The utility sector is that increasingly rare beast in the U.S. economy: an industry with strong demand for new workers; clearly articulated career pathways; and high levels of unionization, with the accompanying labor market arrangements that offer workers entering and advancing in the industry high quality training, good wages and benefits, and lifelong careers. And the sector happens to be the hand on the switch/finger on the button of our nation's transition to a clean energy economy. All of which is to say that whether the utility industry can recruit and train up a sufficient number of workers over the next several years is a subject that is very much in the public interest.

### Case Study 6

## GREENER HEALTH CARE: PARTNERSHIPS, CREDENTIALS, AND ADVANCEMENT

The health care sector, and its relation to the green economy, is notable for a number of reasons: **1)** Health care has received little to no attention as a green or greenable economic sector; **2)** According to the 2010 census, more Americans are employed in the 'Healthcare and social assistance' sector than any other major industry sector, and it's projected to grow steadily as a source of employment in the foreseeable future;<sup>185</sup> **3)** Eight of ten workers in the sector are women, in stark contrast to construction and manufacturing, most frequently cited as the growth sectors of the green economy, in which women are under-represented; **4)** The sector is accessible to workers with low to moderate levels of education and skills, but it also possesses a broad range of occupations that require higher education and skill levels — and as such career pathways have been constructed throughout the sector; **5)** Despite the proliferation of such pathways, it remains an industry in which workers with lower levels of education and skills can easily get stuck in poorly compensated jobs with no room for advancement, where employers invest nothing in their skill development.

The Healthcare Career Advancement Program (H-CAP) is a national labor-management partnership of Service Employee International Union (SEIU) locals and health care employers, operating in 8 states and 10 metropolitan regions. Over the last two years it has implemented a project to green health care and health care careers by focusing on lower-skilled workers whose jobs rank fairly low in the hierarchy of health care occupations and who are not typically viewed as agents of transformation.

In 2010 H-CAP received an ARRA DOL grant to provide green training and develop green career pathways for workers in the environmental service (EVS, aka house-keeping) departments of hospitals administered by their employer partners, and to create 'green systems change' in those hospitals. The "EVS Green Careers Project" operates in 4 different regions of the country: Los Angeles,

Seattle, DC/Maryland and New York City. The project has since expanded to dietary departments in 2 of these regions.

The overarching goal of the Green Careers Project is to impact health care's triple bottom line: people (patients, workers and the community), planet, and profits (costs/institutional viability). EVS workers, with the right training, are ideally positioned within hospitals to make the triple bottom line concrete by implementing practices related to energy efficiency, waste and water use reduction, recycling, and improved cleaning of buildings.

The Project provides training to incumbent frontline EVS workers in 7 modules, involving 12-14 hours of training. Worker and supervisor pairs are trained to co-lead the incumbent worker green training modules. The training includes water and energy conservation in a health care setting; waste reduction; and the reduction of Hospital Acquired Infections (HAI's) through EVS work. Up to 6 additional hours of customized training are also provided, depending on the green focus of projects in different hospitals. For example, in Los Angeles, a focus on HAI reduction led to customized training on the science, identification and use of green cleaning products as a means of reducing worker and patient exposure to toxins in conventional cleaning supplies, which contain chemicals associated with respiratory irritation, skin and eye injury, cancer, and indoor air problems.

H-CAP has enrolled close to 3000 workers in the incumbent worker training across all four regions. The participating hospitals pay for incumbent workers' training time; in the experience of H-CAP leadership, employer partners have never paid for so many hours of training time for EVS workers. At the time of this report, the project has 2225 training completions. (While these are primarily incumbent workers, this number includes H-CAP's green pre-hire, train-the-trainer, and college certificate programs, with some participants completing multiple programs). Roughly 95 percent of trainees are people of color. Half are women. And several hundred



report being immigrants from non-English speaking countries (ranging from Albania to Vietnam).<sup>186</sup>

Implementation of the Green Careers Project in the New York City region illustrates one of the most innovative and important parts of the initiative: the way in which it leverages labor-management committees — a central labor-management institution that dates back to the Taft Hartley Act — to identify ways in which hospitals can be greened and projects that EVS workers can undertake toward that end. These committees — which involve supervisors, front-line workers, and union and management representatives — are the drivers of ‘green systems change’ in hospitals, one of the Project’s primary goals.

In New York City the labor-management committee, involving members of 1199 SEIU Healthcare Workers East and management at one of the region’s major medical centers, explored the possibilities for improving waste management practices in the hospital. They decided to focus on recycling, in particular specific opportunities in the Operating Room (OR) for recycling and plastics reprocessing. In the OR project design phase, the committee engaged partners from throughout the hospital, including nursing, anesthesia, materials management, and administration. Recognizing that success relied in large part on the frontline Building Services Department (BSD) workers (who were the workers participating in the Green Careers Project), the committee made these staff central to the decision-making and design of the recycling effort, ultimately making them responsible for training all new staff and relief staff within the OR on proper practices. BSD staff were also asked to participate in the design of a new, facility-wide recycling strategy.

The results: OR recycling steadily increased after the implementation of the new recycling practices. But the facility-wide metrics are most dramatic. In March (before training) 27.35 tons of recycling were collected. In April and May (after training) 46.43 and 49 tons were collected, representing an average increase of 74 percent.<sup>187</sup>

Another goal of the Green Careers Project was to develop a “Sustainability in Health Care” college-level certificate program as a means to more fully train workers in green health-care practices and to provide them with a credential that they can use for career or post-secondary advancement. The course was developed under the leadership of North Seattle Community College, with input from labor-management committees and college partners in the four regions around the country. The first course was launched in May of 2011 at North Seattle and later in the year at colleges in Los Angeles, New York and DC/Maryland. As of March 30, 2012, 88 workers have completed the course nationally. The course uses project-based learning as a vehicle by which workers develop knowledge and skills around developing, leading, and supporting green change projects at their hospitals. Students analyze current practices in their hospitals that could benefit from being greened, and by doing so increase their problem solving abilities, job relevant knowledge, and new green skills. Students put this analysis into practice within the labor-management committees of their respective hospitals, where they can lead green projects.<sup>188</sup> Completing the course is a pre-requisite for the project’s newly negotiated green lead positions, and could serve as an on-ramp to post-secondary educational pathways for related occupations.

The project-based learning of the certificate course suggests the kind of full-time position that H-CAP is trying to create within the hospital workplace for workers who earn the credential: a “green lead” or “green implementation coordinator” who can support ongoing and new sustainability projects, functioning at the interface between labor-management (LM) committees, EVS staff and, where needed, dietary staff. It’s here that the career advancement potential of this training is inextricably linked to the fact these are union workplaces, where job positions, and career progression from one job to another, are embedded within a broader set of negotiations between labor and management. The scope and

requirements for the new position were created through a remarkable process in which H-CAP engaged labor and management regionally before convening employer and worker representatives nationally to settle on the parameters of the new classification. To date, 8 of 11 employers have created green coordinator positions — a promotional opportunity which entails training responsibilities, project coordination and cleaning responsibilities. Promotions and accompanying increases in salary to green lead and supervisory positions have been negotiated locally for 18 workers. How many positions are ultimately created, and whether these positions are replicated in other hospital workplaces, depends on the extent to which SEIU locals prioritize these new jobs in future contract negotiations with their hospitals, and the extent to which those employers recognize a cost-savings value in having housekeeping staff trained in sustainability practices.<sup>189</sup>

As is the case with career pathways in many sectors, there may be limited vertical mobility here given the relatively limited number of supervisory positions available. But incumbent worker training, which is the bulk of the Green Careers Project, provides rank-and-file workers the requisite skills and knowledge to effectively engage in a hospital's "greening" projects, improving safety and sustainability for all. And like the most far-sighted and nimble programs that "green up" existing occupations and skill sets, it may increase the employability of participants across a variety of positions. As of May 2012, the program counts 123 placements of un- and under-employed workers who completed the green pre-hire training.

### Case Study 7

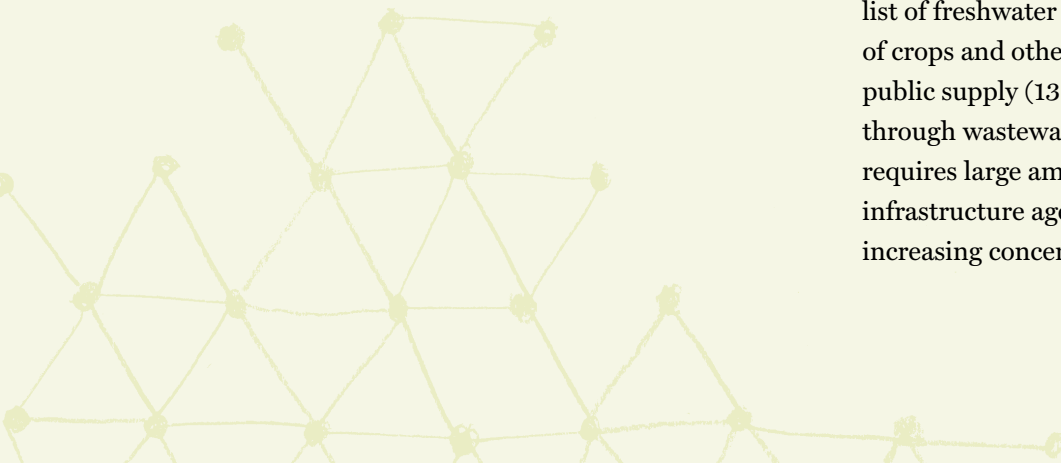
## WATER, WATER, EVERYWHERE

Energy supply and demand tends to dominate discussions about greening the economy. Water, however, is a critical, irreplaceable resource indispensable to energy, agriculture, health — and human life itself. Nothing is sustainable without water.

Only one percent of the world's fresh water is accessible for use.<sup>190</sup> The United States is the largest water market, spending \$107B per year on water infrastructure at a rate of growth of 10-15 percent per year.<sup>191</sup> Water resources vary by geography. The Great Lakes region sits adjacent to the world's largest available fresh water supply, while the Southwest and Plains regions face water shortages driven by topography, use (commercial and domestic), and climate change.<sup>192</sup> The Environmental Protection Agency estimates that by 2013 at least 36 states will experience water scarcity.<sup>193</sup>

The public water system has two parts: a drinking water system and a waste water system. Drinking water systems treat and deliver water collected from freshwater sources. Waste water systems treat and return used water back into the eco-system. In many cities, the infrastructure supporting these systems is deteriorating, over-burdened and reliant upon outdated technologies. As a result, water system failures are increasingly common, leading to service disruptions and overflows of sewage into local freshwater sources.<sup>194</sup>

Limited water access and quality have economic impacts. The energy, manufacturing and agriculture sectors rely on water for production.<sup>195</sup> Energy generation leads the list of freshwater users (41 percent), exceeding irrigation of crops and other lands (37 percent) and municipal/public supply (13 percent).<sup>196</sup> Ensuring water quality through wastewater distribution and treatment, in turn, requires large amounts of energy. As the country's water infrastructure ages, water quality becomes an issue of increasing concern. A recent government study estimated



the monetary burden of water contamination within the public water system at over \$255 million.<sup>197</sup>

Climate change, population growth and urbanization will only increase demand for water access and quality. Where many U.S. cities can adequately project and plan for population trends — and associated infrastructure needs, which parallel population and economic growth — climate change creates unpredictable weather extremes from drought to increased occurrences of 100-year floods.<sup>198</sup> City water systems built to 100-year flood standards have begun to fail with the increased prevalence of severe precipitation events.<sup>199</sup> Cities in arid regions fare no better, with drought reducing the reliability of water supplies and parched land unable to absorb sudden, severe precipitation.

To address the increased burden placed on the nation's aging water infrastructure, a 2011 report by Green for All, Economic Policy Institute, American Rivers and the Pacific Institute estimates a five-year investment need of \$188.4 billion. This level of investment would add \$265 billion and 1.9 million jobs to the economy.<sup>200</sup>

Ideal infrastructure solutions combine both gray and green strategies.<sup>201</sup> The traditional gray-water system of pipes, gutters, and tunnels can be integrated with advanced technologies to more efficiently manage and treat water. Green infrastructure mimics the natural water cycle using vegetation and soil. Permeable surfaces, green roofs, bioswales and rain gardens are common green infrastructure techniques. When combined effectively, the two types of infrastructure strategies improve a community's stormwater management, water quality and CO<sub>2</sub> emissions.<sup>202</sup>

Water infrastructure investments can also create local economic opportunities, leading to jobs in the

construction, utility, and water management sectors, indirect jobs in manufacturing, and induced jobs in the service sector as income is spent in the local economy. Like electrical utilities, water utilities face impending labor shortages as the current workforce enters retirement. Many current water operators were hired over thirty years ago during implementation of the Clean Water Act. Since this initial rash of hires, the workforce has experienced little turnover with many employers using succession planning to fill any vacancies.<sup>203</sup> Green infrastructure solutions also create jobs for landscapers, urban farmers, and maintenance technicians.<sup>204</sup> Thus, as with the other sectors profiled in this report, "green" water jobs are traditional jobs.

The need for improved management of our water resources creates economic opportunities for communities and workers. Milwaukee, Wisconsin, is one city seeking to use water for economic advantage. The city has identified regional assets including over 130 water technology companies, and post-secondary water programs at University of Wisconsin campuses in Milwaukee and Whitewater, Marquette Law School and the Great Lakes Water Institute, as well as programs at Milwaukee Area Technical College and Gateway Technical College.<sup>205</sup> Wisconsin also has vast freshwater assets, with more than 15,000 lakes, 13,500 miles of navigable streams/rivers, and borders two Great Lakes.

Despite its location on Lake Michigan, Milwaukee shares the freshwater challenges of many major urban areas:<sup>206</sup>

- Aging, costly, gray-water infrastructure;
- Five percent of the sewerage district uses a combined system at risk of sewage overflows;
- Overburdened wastewater treatment systems;

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*Water is a critical, irreplaceable resource indispensable to energy, agriculture, health — and human life itself. Nothing is sustainable without water.*

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- Flooding caused by insufficient stormwater infrastructure and flood plain development; and
- Contaminated ground water.

In 2004, Mayor Tom Barrett established the Milwaukee Office of Environmental Sustainability (OES) to improve the city's environment and livability, including stormwater management challenges. Mayor Barrett has also instituted a number of policies to improve water system efficiencies, including requiring a 15 percent reduction in stormwater runoff from city properties, and designating the city's first green corridor.<sup>207</sup>

OES embarked on a comprehensive sustainability planning process for the city in 2012. Created in conjunction with municipal agencies, business leaders, and the public, Milwaukee's sustainability plan will provide a roadmap for using and re-using city resources to include water.<sup>208</sup> As described during an interview with OES Director Matt Howard, the planning effort will address stormwater management and the incorporation of green infrastructure techniques into municipal projects.<sup>209</sup> The Milwaukee Metropolitan Sewerage District (MMSD) will align project development with the city's sustainability plan, establishing specific sustainability targets for infrastructure projects. MMSD's work with OES builds on over ten years and 150 projects of green infrastructure investment.<sup>210</sup>

Global water markets align with the public infrastructure system, divided between drinking water and wastewater. With support from the city, Milwaukee's business and education leaders formed the Milwaukee Water Council in 2009 to identify and develop these markets. The Council's mission is "to align the regional fresh water research community and water-related industries to establish the Milwaukee region as the World Water Hub for water research, economic development, and education."

Members of the Water Council include companies tangentially related to water infrastructure (Kohler), water users (MillerCoors), advanced science/

engineering companies (Advanced Chemical Systems), start-ups (Aquamost), and manufacturers (BadgerMeter). A 2009 study of Water Council businesses revealed 66 percent of respondents with demand for engineers and scientists, and only 19 percent needing production workers such as machinists, steamfitters, and wastewater operators. Notably, the businesses found skilled workers to be the most difficult to both attract and retain.<sup>211</sup> The Council's capacity to generate associate- and journey-level jobs matches that of many "green" investments: not creating immediate employment opportunities, but rather providing a long-range economic development strategy. According to Dean Amhaus, Executive Director, the Water Council is "not interested in the rhetoric around job creation numbers, but rather focused on the quality of jobs and economic growth for existing businesses."<sup>212</sup> An economic development organization, the Water Council seeks to facilitate knowledge transfer from the region's education and research institutions to develop companies, products and entrepreneurs.

Public and private efforts to develop a Milwaukee water sector have led to several training programs for workers. At best, these efforts are loosely connected. Through its Training/Education Committee, the Water Council is working with a network of over sixty organizations to align and leverage these local training resources. Public, private, nonprofit, and educational organizations meet on a quarterly basis to define the sector's workforce needs and connect workers at all levels to existing opportunities. The Committee currently has one articulated, measurable goal: to have 1 percent of all students pursue a career in water by 2013.<sup>213</sup> Committee members have yet to establish measurable goals for connecting Milwaukee's marginalized and under-represented populations to the sector.

Although efforts to align the workforce system with opportunities in water are just beginning, the existing programs incorporate many of the policies and practices needed for system reform. They are sector-based, target

under-skilled, low-wage individuals, and use industry partnerships to define workforce needs and verify training relevance.

This study highlights three of these training efforts: **1)** the Milwaukee Area Workforce Investment Board (MAWIB) **Jobs Accelerator Project**, **2)** the Milwaukee Area Technical College (MATC) **Water Technology Career Pathway**, and **3)** Wisconsin's Sector Alliance for the Green Economy (SAGE) **Waste Water Treatment Plant Apprenticeship**.

The Milwaukee Workforce Investment Board (MAWIB) has represented the needs of Milwaukee workers and under-skilled populations on the Water Council since its inception. Through a Workforce Innovation in Regional Economic Development (WIRED) program grant, MAWIB helped the Water Council identify regional water industries and businesses, associated occupations, and relevant workforce skills and training programs. The grant culminated in recommendations for building a water workforce that included curriculum needs and career paths. This work defined Milwaukee's water sector as:<sup>214</sup>

- Focusing on all aspects of the water cycle: extraction, treatment, delivery, use, treatment and return to source;
- Consisting of 15 industries in five clusters: public-sector water utilities, water utility facility construction, plumbing, water utility consulting, and waste/landfill;
- Including 71 occupations that require a high level of water knowledge; and
- Needing "Water 101" early in technical education programs, certificate programs that build to higher credentials, and experiential learning programs.

The Water Council's Talent/Education Committee has continued this work, coordinating an industry-led Career Advisory Work Team to provide guidance on pathways to jobs in the water sector.<sup>215</sup> These businesses have identified manufacturing and food/beverage processing as additional sources of water-related jobs. Council businesses indicated that many water sector jobs require some post-secondary training, including math, computer, science (chemistry mechanics), lab, and electronics skills. And they favored candidates with two-year degrees and industry-recognized or apprenticeship certificates over the common practice of hiring engineers for technician positions.

In 2011, the collaboration between MAWIB and the Water Council led to a federal Jobs and Innovation Challenge Grant for Milwaukee, supported by the Economic Development Administration (EDA), Small Business Administration (SBA), and the U.S. Department of Labor Employment and Training Administration (DOL). Labor market data at the time of the grant application indicated fifteen occupations in manufacturing, water control and engineering with the



greatest number of openings. These occupations had 2010 hourly wages averaging from a low of \$11.91 (production workers) to a high of \$27.60 (mechanical engineering technicians). Notably, the analysis included only one water-specific occupation — Water and Liquid Waste Treatment Plant and System Operator — with an average hourly wage of \$21.54.<sup>216</sup> In Wisconsin, wastewater operators are union positions with career ladders, job security and family-sustaining wages. The occupation also requires certification through the Wisconsin Department of Natural Resources.<sup>217</sup>

The DOL portion of the Jobs and Innovation Challenge Grant (\$1 million) is intended to support job growth at this nexus of manufacturing, engineering, water, and energy, and to provide opportunity for Milwaukee area workers. This **Jobs Accelerator Project** includes all three members of the area's Regional Workforce Alliance: MAWIB, the Southeast Wisconsin Workforce Development Board, and the Waukesha-Ozaukee-Washington (WOW) Workforce Development Board. These WIBs (or WDBs, as they are known in Wisconsin) will develop career pathways in water technician/engineering and water advanced manufacturing. Specific workforce goals are: **1)** to develop employees with technical skills to enhance earning potential and employer productivity, and **2)** to connect low-income, at-risk populations to the water cluster.

Partnerships with the Water Council (EDA Grant) and the Milwaukee Small Business Development Center (SBA Grant) are at the heart of the project, with a stated goal of coordinating workforce and economic development activities. Other project partners include regional technical colleges, university engineering programs, the Wisconsin Regional Training Partnership, the Center for Veteran's Issues, and the Milwaukee Water Council Talent Committee.

The Regional Workforce Alliance plans to meet its goals by targeting different worker populations.<sup>218</sup> MAWIB will focus on low-income, at-risk, and under-represented groups: older youth graduating from STEM programs,

dislocated workers, and veterans. The Southeast and WOW boards will work with incumbent workers in Water Council companies. The alliance has four years to train 160 individuals.<sup>219</sup> Funding is divided equally among the workforce partners.

MAWIB's program will feature occupational training, support services, internships, and sector outreach. In consultation with Water Council businesses, MAWIB has created a Water Skills Certification System mapping career paths and competencies. This pathway begins with an entry-level water technician occupation. In conjunction with the Milwaukee Area Technical College (MATC), MAWIB has proposed a short-term technical diploma for water technicians. This Water Technician Diploma will provide workers with foundational math, chemistry, physics, environmental health and "Water 101" knowledge, as well as lab and electrical skills. Business feedback indicates that these qualifications are in demand across traditional industries: advanced manufacturing, water utilities, construction, and food/beverage processing. In developing the diploma, MAWIB is specifically focusing on skill sets required by advanced manufacturing employers.

MATC will deliver the training through a cohort model and the realignment of existing courses. Participants can complete the diploma in less than a year, taking the courses in any sequence. Successful graduates will earn up to 25 hours of technical college credit.

To enter the program, individuals must meet technical college entry requirements, including satisfactory scores on the Accuplacer Test. At-risk and lower-skilled workers who fail to achieve satisfactory test scores may be placed in a preparatory course designed to improve math and reading scores. With a goal of improving participant outcomes, the project will also offer student support services and dual enrollment in public assistance programs as appropriate. Support services will include mentoring, career counseling and employment services. On a case-by-case basis the program will provide financial assistance with student fees,

books and equipment. MAWIB will work with Water Council businesses to develop internship opportunities for program graduates.

MAWIB is currently seeking industry validation of the course sequence, and certification associated with the water technician training. Articulation agreements with regional universities that lead from associate degrees offered by the technical colleges to bachelor's degrees in engineering or water science are also planned. The Wisconsin Regional Training Partnership — a nationally renowned workforce intermediary with deep ties to industry, community, and labor — and the One Stop job centers will assist with program outreach.

The Milwaukee Area Technical College (MATC) also offers a **Water Technology Career Pathway**, which includes bridge and occupational certificates that ladder into environmental health and water quality associate degrees. The Water Technology career pathway was developed as part of the Regional Industry Skills Education (RISE) partnership between the Wisconsin Technical College System and the Department of Workforce Development, and may at some point provide a model or courses for the Jobs Accelerator training.

The first course in the pathway, Green Technologies, helps students develop the math, reading and communication skills needed for successful completion of a technical degree. Participants are also introduced to the basics of energy efficiency and building systems (heating/cooling, plumbing, and lighting).<sup>220</sup> Students must meet minimum adult basic education (ABE) levels prior to admission. Green Technologies transitions students from this minimum ABE level to the first level of occupational training: Introduction to Environmental Health & Water Quality. Students achieving higher ABE scores can enter the pathway at this occupational course.

Environmental Health and Water Quality is the introductory program course for the associate degree. This three-credit course introduces students to air, water and food quality concepts, as well as the roles

and responsibilities of environmental practitioners.

To earn the first credential along the Water Technology Career Pathway, the RISE Green Technologies Certificate, students must successfully complete the introductory program course and earn their GED Certificate/H.S. Diploma.

The Green Technologies Certificate prepares students for internships with the environmental/custodial services and operations and maintenance departments in a wide variety of firms, and for the academic requirements of the Environmental Health and Water Quality Technology Associate Degree program. Although the pathway is designed to allow students to move back and forth between work and learning, advancing in the labor market as they gain credentials for completed “chunks” of an academic program, completion of the first certificate provides few established industry links.<sup>221</sup>

MATC identifies custodial positions as entry-level opportunities for certificate holders—opportunities that provide a period of on-the-job training and entry into facility operations and maintenance. Certainly one goal of the region's Jobs Accelerator Grant is to connect workers with basic skills to career paths in local firms, and some of the Milwaukee Water Council businesses expressed demand for employees with “basic water knowledge.” But it remains to be seen if MATC's Green Technologies Certificate will be a significant factor in local hiring.

MATC also identifies “waste water treatment operator” as a targeted occupation for the training. These infrastructure jobs offer greater security and family-sustaining wages, but also require extensive technical water knowledge and professional certification. The Green Technologies Certificate provides only foundational water knowledge and skills. It is unlikely that participants would qualify for these positions without further training. The Milwaukee Metropolitan Sewerage District's Workforce Development and Training Program is one possible step along the pathway to public utility jobs.<sup>222</sup> While not well-connected to the project described here,

MMSD's training program provides access to both apprenticeships (through WRTP) and internships (from regional universities) for non-traditional worker populations.

Alongside these efforts, Wisconsin's Sector Alliance for the Green Economy (SAGE) funded the creation of a **Wastewater Treatment Plant Apprenticeship**. SAGE, created through a \$6M ARRA State Energy Sector Partnership and Training Grant, aims to "green up" jobs in the construction, manufacturing and utility industries, and create opportunities for apprentices and journey workers to learn green skills.<sup>223</sup> The three-year registered wastewater apprenticeship, administered by the state's Bureau of Apprenticeship Standards, is designed to introduce participants to all of the work processes related to water treatment, along with knowledge of the latest water technologies and sustainability concepts.<sup>224</sup> The program uses a classic hybrid model that interweaves 5,500+ hours of on-the-job training with 432 hours of paid instruction by requiring students to successfully complete learning hours and competencies in order to progress with the on-the-job tasks.

The Wastewater Treatment Plant Apprenticeship seeks to create a statewide pipeline for water utilities facing labor shortages as current workers retire. As in the health care and energy sectors, however, retirement-induced demand has been delayed. Firms are not currently hiring apprentices, resulting in no participants in this program to date.<sup>225</sup> The program is also not formally connected to the efforts of the Water Council, the Milwaukee Jobs Accelerator Grant or the Water Technology Career Pathway. Given that public infrastructure positions offer some of the best opportunities for decent work at family-sustaining wages, efforts to advance Milwaukee's low-skilled populations should build bridges to these apprenticeship opportunities — once there are jobs sufficient to create and sustain them.

The Water Council's commitment of staff resources to convene and coordinate water training/education holds promise for its future as an effective workforce intermediary. Currently the Jobs Accelerator Project, the Water Technology Career Pathway, and the Wastewater Treatment Plant Apprenticeship do not form a seamless career pathway to standardized credentials and technical jobs. The question of demand also remains. Retirements have yet to open up water utility or private-sector jobs. And, the Council has acknowledged that its goal is not jobs, but the creation of an industrial-research hub serving the global water market. Through honest, robust engagement of its member businesses, the Water Council can establish a realistic picture of demand for associate- and journey-level workers. In turn, the reality of Milwaukee's water sector should be used to right-size training investments and programming to serve not only engineers and scientists, but also the city's vulnerable and underemployed worker populations.

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*The Water Council is "not interested in the rhetoric around job creation numbers, but rather focused on the quality of jobs and economic growth for existing businesses."*

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