Verifying Energy Efficiency Job Creation: Approaches for a Recommended Framework

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ABSTRACT

Energy efficiency programs are often rolled out with the expectation that they will not only save energy, but also create employment opportunities. However, measurement and verification of these employment impacts can pose challenges.

Programs seeking to verify their job creation impacts use a variety of approaches that fall into one of two primary categories: 1) input–output or computable general equilibrium modeling to estimate the job creation, or 2) a head-count verification of direct jobs. The first method can be problematic because it makes use of an approach created to predict job creation impacts rather than count them, and may prove inadequate in providing evidence of real-world impacts. On the other hand, the head-count approach often underestimates the full direct, indirect, and induced employment opportunities. In some cases, discrepancies between jobs estimated and those captured in head counts result from inconsistencies in the definition of the "job" metric. To date, no generally accepted practice for energy efficiency job creation verification exists.

This paper will weigh the strengths and weaknesses of each approach to energy efficiency job creation and will elaborate on some of the reasons for discrepancies between the results of ex-ante and ex-post analyses. A standard method for verifying job creation should be: 1) credible to a policymaking audience, 2) appropriate and accurate in its use of modeling tools and estimation, 3) comprehensive and in line with the "narrative of a healthier economy," 4) replicable and cost-effective, and 5) able to generate comparable results for cross-program comparison.

Introduction

It has long been argued that energy efficiency is an investment with value that extends well beyond environmental benefits. In fact, there is evidence that suggests that investment in energy efficiency can build a stronger and healthier economy (Laitner et al. 2012). The economic argument that articulates how energy efficiency creates jobs is powerful and nuanced. However, the "small but net positive" metrics produced through thorough analysis of energy efficiency job creation potential are often drowned out by competing claims from other industries vying for investment (Laitner and McKinney 2008).

In recent years it has been challenging to find reliable and consistent job creation metrics for purposes of evaluation between fields. Even more troubling is the fact that approaches and assumptions used for predicting energy efficiency job creation within the field of energy efficiency are highly variable. One of the major discrepancies and a strong illustrative example of the challenges faced in interpreting job creation numbers are inconsistencies in reporting "net" and "gross" job creation.

"Net jobs" are described by the American Council for an Energy-Efficient Economy (ACEEE) as "the number of jobs created in an industry and its supply chain compared to a 'business-as-usual' reference case" (ACEEE 2011). "Gross jobs" are defined as "the total

number of jobs produced by an industry and its supply chain" (ACEEE 2011). When policymakers compare programs in an effort to make spending decisions that drive economic development and job creation, comparing net and gross numbers can be highly confusing. This is a contributing factor to growing skepticism over the presentation of job creation claims (Kessler 2011; New York Times 2012; and Goad 2013). Compounding this already serious issue of incomparability between predictive estimates is the growing need for consistent approaches to verifying energy efficiency job creation.

In 2009, the American Recovery and Reinvestment Act rewarded $16.8 billion to the U.S. Department of Energy to spend on energy efficiency and renewable energy projects and initiatives (DOE 2014). In addition, hundreds of millions of dollars have been spent by state and local governments for energy efficiency. While private sector capital is beginning to supplement the market (Lacey 2014), the future of public dollars, some of which provide valuable credit enhancement to encourage the flow of private dollars, is uncertain. In order to preserve and grow these programs, it is essential for the field to establish a common narrative and provide compelling evidence of the true job creation potential of energy efficiency.

The Narrative of a Healthier Economy

Economic models of job creation estimate job creation for any shift in spending in the economy. This is why the reporting of net job creation is so important. Investments in pipelines, power plants, and baseball stadiums all create jobs.

Labor intensities, or the proportion of labor required for a given level of investment, across various industries for a given region are used to estimate the number of jobs a given investment amount will support. Figure 1 shows labor intensities for a $1 million investment in several sectors of the economy that are relevant to investment in energy efficiency.

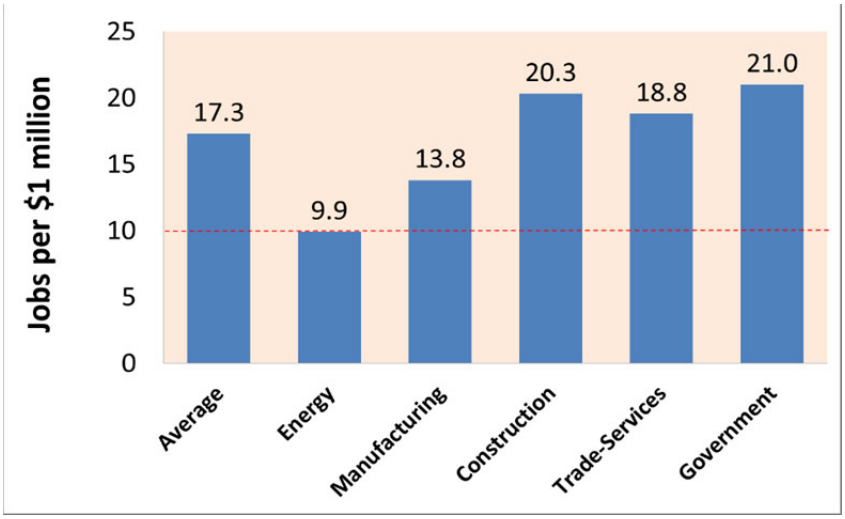

Figure 1. Jobs per million dollars of revenue by key sectors of the US economy. *Source*: MIG 2011 and ACEEE 2011.

A key advantage to energy efficiency is that it not only creates jobs with the initial investment by creating jobs to deploy efficiency technologies like building upgrades, but also that once the deployment is complete, the investment also creates jobs on an ongoing basis as spending shifts away from energy production and distribution (indicated by the "Energy" label above), and into the broader economy, which is more labor intensive on average (indicated by the "Average" label above) (ACEEE 2011). This second, ongoing redirection of expenditures from "Energy" to "Average" is the rationale behind the claim that energy efficiency investment drives a healthier economy that can support a higher level of employment than comparably sized investments. We characterize this perspective as the "narrative of a healthier economy."

ACEEE describes the two spending shifts that drive energy efficiency job creation as follows:

> Generally, an initial investment in energy efficiency drives direct, indirect, and induced jobs in labor-intensive industries such as construction, engineering, maintenance, and contracting. Direct jobs are created as workers are deployed to develop and install the efficiency measures. Indirect jobs are subsequently created in the supply chain at facilities such as lumber yards and with manufacturers such as plumbing suppliers. Then, as newly employed workers spend their earnings, induced jobs are created in a wide variety of service and retail industries throughout the economy.
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> The second round of job creation occurs as individuals and businesses re-spend the money that they saved through lower energy bills, and this wave of job creation reverberates throughout the economy over the long-term. In fact, this is where the bulk of energy efficiency job creation resides. Dollars once spent on energy bills are put back into the general economy (which is, on average, more labor intensive than energy production and distribution), and ongoing job creation is stimulated. The recognition of energy savings, in the form of lower energy bills, causes consumers and businesses to redirect their prior spending into other activities to support higher levels of employment in the form of direct, indirect, and induced jobs.
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> For example, a factory that recognizes significant energy savings from a retrofit of its facilities may be able to support (or maintain) direct jobs as a result of increased competitiveness. Depending on the demand for goods and services from the beneficiary, factory suppliers may also see a small but net positive increase in employment. And, as with the first mechanism, induced jobs are generated as new workers spend their earnings in the surrounding economy (Bell 2012).

Returning to Figure 1, we can observe that for the second shift in spending, we are creating approximately seven jobs per $1 million investment.[1] In the case of a retrofit project with a measure life of 15 years, the economy will support these seven net jobs year by year for 15 years.

These jobs are not easily captured and verified in ex-post analysis, but they are critical to supporting the persuasive argument that energy efficiency is a worthwhile investment for supporting job creation. Thus, it is likely that an effective verification method will have to

[1] By shifting from "Energy" to "Average," we create a difference of approximately seven jobs: 17.3 – 9.9 = 7.4.

include both components that provide both proof of actual job creation from the initial investment and an estimating component that accounts for the second shift.

Current Approaches to Job Verification

Programs seeking to verify their job creation impacts use a variety of approaches that fall into one of two primary categories: 1) input–output or computable general equilibrium modeling to estimate the job creation, or 2) a head-count verification of direct jobs. The former approach can be problematic because it utilizes an approach created to predict job creation impacts rather than count them, and may prove inadequate in providing evidence of real-world impacts. The head-count approach often underestimates the full direct, indirect, and induced employment opportunities. Figure 2 elaborates on the strengths and weaknesses of these approaches.

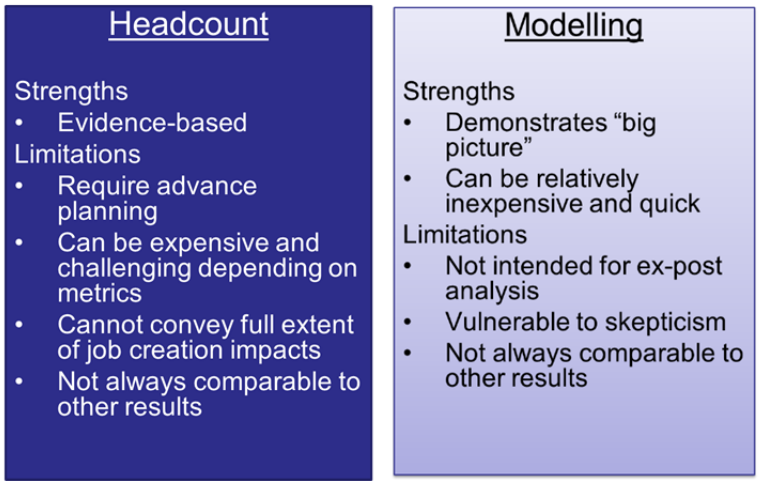

Figure 2. Strengths and Limitations of Current Approaches to Job Verification *Source*: Bell 2014(b)

In both cases, discrepancies between jobs estimated ex-ante, or before an investment is made, and those measured or estimated ex-post (after an investment is made) result from inconsistencies in the definition of the "job" metric.

Defining the "Job" Metric

From an economics standpoint, "jobs" are created through shifts in spending patterns between industries in the economy. A "job" in this case is defined in many economic analyses as "a metric that is equivalent to the resources required to employ 1 person for 12 months (or 2 people for 6 months each, or 3 people for 4 months each), which can be full or part time" (MIG 2011).

While this definition is often used in predictive analysis, it is not always clear to a lay reader that this metric might differ conceptually from commonly held beliefs about what constitutes a "job." Energy efficiency is often thought of as a creator of "green jobs." According to the United States Bureau of Labor Statistics, there are two definitions for "green jobs."

Definition A includes:

Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources (BLS 2014)

Definition B includes:

Jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources (BLS 2014)

Existing programs may apply requirements that further constrain the definitions above. These constraints may be useful in helping them track the success of the program in accordance with their local economic development goals, but may be problematic for comparing outcomes with other programs across the country. For example, in the District of Columbia, reports of energy efficiency job creation must report on "green job" creation defined, among other things, as jobs that both pay a "living wage" and are held by a District resident (Jerome Paige & Associates 2013).

These parameters are likely important to assisting local policymakers in targeting resources to specific programs. Though there may be unintended consequences to using highly specific definitions, other policy goals are determined by local policymakers. However, when they use broadly accepted terminology to describe narrowly defined goals, this can lead to confusion when comparing results to other localities using broader (or differently constrained) definitions of job creation. The end result is the absence of a common metric with which to track progress across a range of programs or to compare results among them.

The "narrative of a healthier economy" would suggest a more holistic perspective on job creation from energy efficiency. A compelling standard method for verifying job creation must therefore look beyond the definition of a green job. Additional requirements such as living wages and geographic origin of the employee can be costly and difficult to track and estimate, particularly in a region such as the Washington, DC, metro area, which draws workers from surrounding areas in Virginia, Maryland, and West Virginia daily. Associated costs in tracking can even hurt the job creation bottom line by absorbing resources that could be leveraged to support program employment or additional job-supporting projects. While potentially useful in certain contexts such as comparing economic development projects within the city limits, these requirements also make it challenging to compare it with other energy efficiency and non–energy efficiency programs across the country.

Understanding the Structure and Purpose of Job Impact Models

Often, job creation is predicted using an input–output model or a computable general equilibrium model (CGE). In the energy efficiency field, commonly used input–output models include IMPLAN, ImSet, and RIMS. REMI is a commonly used model that makes use of CGE techniques.

These models are often based on shared accounting matrices that represent how industries within the economy trade goods and services with one another. These matrices are typically based on data from the Bureau of Labor Statistics, the Bureau of Economic Analysis, and other sources (MIG 2011). To derive multipliers that represent how many jobs (or how much economic activity) are created per $1 million invested in each sector of the economy, analysts

will apply a series of manipulations to these matrices to represent spending pattern tradeoffs the investment will drive between industries (Bell 2014a).

In recent years, these tools have also been leveraged by numerous programs for the purposes of verifying job creation. One drawback to this approach is that without modification, a model will generate the same results for an estimated shift in spending patterns both before and after an investment is made. This is problematic when you are verifying rather than predicting job creation. In other words, estimation results may not reflect the realities of the program's implementation. It is very important when estimating impacts for the purposes of verification to carefully track and account for any unbudgeted or unpredicted alterations in program spending. During implementation, discrepancies can occur between budgeted and actual spending on overhead, projects, and materials, which can significantly affect the ability of the investment to support jobs. In addition, structural shifts in the economy can also affect the accuracy of these models, as there is often a lag between economic shifts and the release of new model data. It is a good practice to extract the data and apply real-time assumptions to the model to ensure greater levels of accuracy.

In an effort to obtain realistic numbers, tracking direct employment through contractor networks can provide analysts with a basis for a "reality check" on their numbers. It can also enhance estimation by providing hard evidence of actual economic activity. Some degree of estimation is critical for supporting the "narrative of a healthier economy," as it can be challenging to directly collect that information. It is still unclear whether use of a full-fledged economic model is an important component of this approach, and this topic will be explored through data collection from actual programs in our future work.

Manually Counting Local Job Creation

At first glance, it may appear as though tracking direct job creation from program spending could be as simple as counting workers on a job site. However, doing so will not necessarily result in a consistent job metric across programs. Recall that the job metric also counts the resources available to support employment, rather than only the individuals working on a given project. In addition, from the contractor's perspective, project revenues do not always simply cover the individuals installing energy efficiency measures. These revenues may also cover accountants and other employees working in the business's main office.

Clean Energy Works Oregon (CEWO) provides an example of a sophisticated approach of tracking and estimating job creation. CEWO is a nonprofit program that provides turnkey solutions for residential retrofits. CEWO hired a workforce specialist to construct and maintain a detailed database of contractor employment data. Contractors associated with CEWO report information about their employees for every project, and the workforce specialist uses the information (including hours worked, project costs, and job classifications) to determine the job creation that is attributable to the program. The workforce development specialist can use this information to provide additional estimations of other job impacts in the local economy (Green for All 2013). A potential drawback to this approach is maintaining cost-effectiveness. In addition, it could be challenging to keep contractors actively engaged.

It is important to note that when tracking high-level employment data from contractors, it can be difficult to distinguish job creation from energy efficiency and non-efficiency projects. The tracking of indirect and induced jobs through contractor sourcing data can further conflate this information as degrees of separation from initial program spending make it more difficult to account for the job creation activity that is directly attributable to the energy efficiency program

or investment. Furthermore, it may be particularly challenging to provide concrete evidence of net job creation, as it could be challenging to measure and verify jobs that were not created and maintained in other industries.

Rigorous data collection and analysis can be resource intensive in terms of cost and labor (Green for All 2013). When developing a standardized approach, it is important to account for cost-effectiveness to ensure the replicability of the method.

Recommended Considerations for Creating a Generally Accepted Method

There are currently initiatives underway to standardize and create a generally accepted method for verifying energy efficiency job creation. ACEEE recently initiated a study to collect information from existing programs on their current practices for verifying energy efficiency job creation. The ultimate objective is to evaluate these efforts, distill best practices, and provide a generally accepted method for this type of analysis. Until data collection is complete, it is challenging to provide concrete and specific advice on how to structure efforts to capture and provide evidence of job impacts. However, given the discussion above, we are comfortable with providing the following high-level guidance for head counts and estimation efforts.

In general, the ultimate proposed method should maximize efficiency and effectiveness in accordance with five criteria. It is important that the approach be:

1) Credible to a policymaking audience
2) Appropriate and accurate in its use of modeling tools and estimation
3) Comprehensive and in line with the "narrative of a healthier economy"
4) Replicable and cost-effective
5) Able to generate comparable results for cross-program comparison

Data collected on individual programs will be evaluated based on these criteria and the ACEEE will form additional recommendations around existing best practices.

Guidelines for Estimating

Models should be customized to reflect current information about the program's local or regional economy. Actual program spending should be rigorously tracked and updated within the model as appropriate. Net job impacts, as opposed to gross job impacts, should be the standard metrics reported. This will require comparing results of the model to a "business as usual" scenario that excludes program implementation. If financing is a component of the program, results should be adjusted to reflect actual interest rates and loan repayment data. Results should be reported as an order of magnitude estimate rather than a definitive representation of actual jobs created.

Deductive approaches that leverage real employment data should account for job creation in affected industries that did not result from energy efficiency.

Guidelines for Counting

Additional parameters on the definition of a job should be limited when generating results for comparisons with other programs. These parameters are certainly acceptable when a program is self-evaluating with respect to its specific internal or local goals. Providing

standardized reporting requirements for contractors affiliated with the program can streamline the process. Observation of contractor spending on materials and equipment if tracked over time can be used to deduce loose estimates of indirect job creation.

Care should be taken when comparing the results of data collection and analyses to initial estimates of potential job creation. Reported results should specify that additional job creation was likely recognized within the economy through the "narrative of a healthier economy."

Additional Conclusions

It is important to note that this framework for developing a method for verifying and tracking energy efficiency job creation may not suit all audiences. For instance, the narrative of a healthier economy may not be the most useful way to portray the importance of workforce development programs in ensuring that there is a labor force prepared to meet the demand for energy efficiency improvements. In addition, local programs should be empowered to set their own specific objectives, and to measure their performance relative to those objectives however they see fit.

Another area requiring further exploration is the measurement and verification of energy efficiency investments beyond traditional retrofits. It could be useful to learn how intelligent efficiency encourages direct investment in energy efficiency measures, and how those technologies impact job creation. Evidence also suggests that efficient manufacturing practices could play a role in bringing previously outsourced jobs back to American soil (GE 2012). It could also be interesting to explore how to capture these effects.

Ultimately, coordination and standardization are major keys to capturing the non-energy benefits of energy efficiency, and to ensuring their support and funding in the future. The ACEEE is poised to lead these efforts, and is collaborating with various utilities, regional energy efficiency organizations, nonprofits, and economic development offices for both feedback and buy-in to the eventual standard method.

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