How Does Energy Efficiency Create Jobs?

JOBS ANALYSIS 101

In a time of sustained high unemployment, it is no wonder that job creation has become such a hot topic among pundits and policymakers. It is nearly impossible to read the news without encountering a reference to how a policy or industry creates a given number of jobs. Often, job creation is used as a justification for public sector investment in a program, policy, institution, or project. You may also see numbers from the energy industry as different sectors claim their particular resource creates jobs. These claims, however, rarely or clearly explain how job creation assessments are carried out and what those numbers actually mean. The American Council for an Energy-Efficient Economy (ACEEE) regularly prepares comprehensive analyses and reports regarding the impacts of energy efficiency on the economy, including employment. In this fact sheet, we hope to provide some clarity on how net job impacts should be estimated, and demonstrate how investments in cost-effective energy efficiency improvements can yield a net positive benefit for the nation's overall employment.
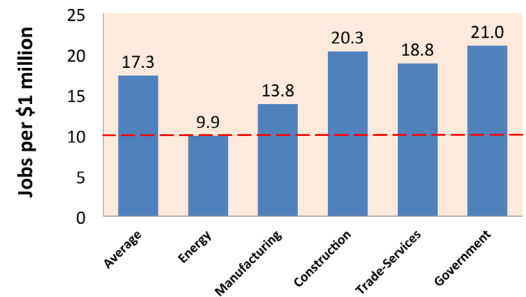
HOW ARE JOBS DEFINED IN ECONOMIC ANALYSIS?

In almost all of ACEEE's assessments, jobs are defined as shown in Table 1. ACEEE evaluates energy policies for their contribution to net job creation against a baseline employment scenario. This means that net jobs (see Table 1) are created only when the employment created by an investment extends beyond the "business as usual" scenario—the number of jobs that would have been supported on average across all sectors of the economy by that same investment amount.

Readers should be aware that other analysts often opt to report job creation in terms of gross jobs (see Table 1) without assessing impacts relative to the "business as usual" case. This approach inflates the estimates by neglecting to provide context. For example, a power plant may support 100 jobs, but

Figure 1. Jobs per Million Dollars of Revenue by Key Sectors of the US Economy

the economy might be able to support 170 jobs if funds were not required to keep the plant running. In this scenario, saying that the power plant creates 100 jobs is misleading.

HOW DOES ENERGY EFFICIENCY IMPACT EMPLOYMENT AND CREATE JOBS?

To understand how a cost-effective energy efficiency investment can create jobs, it is important to consider how efficiency redirects funds away from less labor intensive sectors of the economy in order to support greater overall employment. On average, $1 million spent in the U.S. economy supports approximately 17 total jobs (including direct, indirect, and induced jobs—defined in the example below). Investments directed towards a specific industry may support greater or fewer jobs depending on the industry (you can see in Figure 1 that manufacturing supports approximately 14 jobs per $1 million investment, while the trade-services sector supports just under 19 jobs).

So, an investment in energy efficiency will first create opportunities for workers in industries that are more labor intensive than average (as you will see in our example, a retrofit project will create jobs in the construction sector, which supports approximately 20 jobs per $1 million, compared to the all-sector average of 17). Then, it will continue to support jobs year after year by saving energy. The energy

Table 1: Common Terms Used in Jobs Analysis	
Job	A metric that is equivalent to the resources required to employ 1 person for 12 months (or 2 people working 6 months each, or 3 people for 4 months each). Can be full-time or part-time.
Gross Jobs	The total number of jobs supported by an industry and its supply chain.
Net Jobs	The number of jobs created in an industry and its supply chain compared to a "business as usual" reference case.
Direct Jobs	Jobs generated from a change in spending patterns resulting from an expenditure or effort. (e.g. construction jobs for a retrofit project).
Indirect Jobs	Jobs generated in the supply chain and supporting industries of an industry that is directly impacted by an expenditure or effort.
Induced Jobs	Jobs generated by the respending of received income resulting from direct and indirect job creation in the affected region.
Labor Intensity	The number of jobs necessary to support the spending required to produce goods and services.

savings generated by the investment redirects spending away from the energy industry, which supports just under 10 total jobs per $1 million (see Figure 1), back into the overall economy (which supports 17 jobs per $1 million).

In other words, a net increase in jobs from energy efficiency, for the most part, is the result of two major changes: 1) an initial expenditure or effort that drives energy bill savings; and 2) the subsequent adjustment in spending patterns brought about by that initial expenditure or effort.

Let's look at an example:

A city decides to use $15 million of its revenue to improve energy efficiency in public buildings. These improvements will save the city $3 million a year for the next 20 years.

Three types of jobs are created from this investment. First, a construction contractor will have to hire workers to install the desired
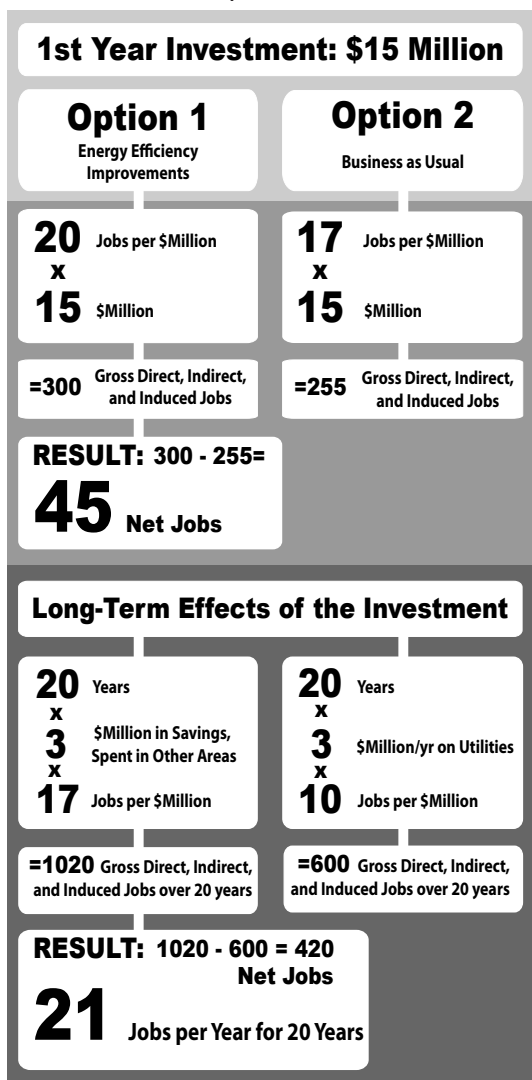
energy efficiency measures. These contractor jobs are the direct jobs resulting from the investment. In addition, the workers will require materials that they have to purchase from other companies (e.g., insulation, tools). These purchases create jobs throughout the economy for manufacturers and service providers that supply the building industry. These supply-chain jobs are the indirect jobs resulting from the investment. Finally, workers in these direct and indirect industries may choose to spend their earnings on goods and services in the local economy, creating induced jobs.

For our example, we can assume that funds will be redirected from their "business as usual" spending pattern and channeled into the construction industry, which is more labor intensive than the average sector of the economy. This will support approximately 20 (direct, indirect, and induced) jobs per $1 million investment. In this case, the tradeoff (from spending that supports 17 jobs per $1 million to spending that supports 20 jobs per $1 million) results in an additional 45 jobs in the year the upgrade occurs (see Figure 2).

Additionally, energy efficiency generates energy bill savings over the life of the investment, which frees up funds to support more jobs in the economy by shifting jobs in the energy generation and distribution industries (lower labor intensity: 10 jobs per $1 million) to jobs in all other industries (higher labor intensity: 17 jobs per $1 million on average). We assume that our investment will save $3 million a year for 20 years, thus achieving a net gain of 21 jobs per year (see Figure 2).

As you can derive from Figure 2, the "business as usual" (pre-efficiency) scenario supports 855 gross jobs (255+600) in the first year, which sounds like a lot of jobs (and 600 gross jobs year after year for the next 19 years). However, you can also see that the efficiency scenario supports 1,320 gross jobs (300+1,020) in the first year (and 1,020 gross jobs year after year for the next 19 years), which is greater than the number of jobs supported by "business as usual." Therefore, energy efficiency creates 66 net jobs in the first year, and continues to support an additional 21 net jobs year after year for the 20-year life of the investment.

HOW DOES ACEEE DETERMINE THE NUMBER OF JOBS CREATED BY A GIVEN POLICY, PROGRAM, INSTITUTION, OR PROJECT?

ACEEE uses its in-house Dynamic Energy Efficiency Policy Evaluation Routine (DEEPER) modeling system to evaluate the economy-wide impacts of a variety of energy efficiency and climate policies at the local, state, and national level. For more information on the DEEPER modeling system, see http://aceee.org/fact-sheet/deeper-methodology.

Figure 2: $15 Million for Energy Efficiency Improvements

1. This definition of jobs is also used by the U.S. Bureau of Labor Statistics, U.S. Bureau of Economic Analysis, and MIG, Inc.
2. These job multipliers are derived from IMPLAN. MIG, Inc. 2009. "IMPLAN US Model 2009 All Sectors." Hudson, WI: MIG, Inc.
3. It is important to note that the $1 million expenditure does not divide neatly into workers' salaries (17 people are not making $59,000 a year as a result of this investment).
4. The energy industry, in Figure 1, includes power generation and distribution from a variety of fuels. The fuel mix can be adjusted depending on the analysis, which could slightly alter the number of jobs supported per $1 million.
5. The IMPLAN social accounting matrices used by ACEEE to perform input-output analyses accounts for leakages, or money that will be spent outside the analyzed region's economy. MIG, Inc. 2009. "IMPLAN US Model 2009 All Sectors." Hudson, WI: MIG, Inc.
6. Please note that to simplify our calculations in this example we assumed that energy savings would be recognized immediately in the first year of the investment. Typically in our analyses, we assume that energy savings are recognized at least six months to one year after the efficiency measures are implemented. Future estimates of net jobs will also be affected by changes in labor productivity and other factors such as price adjustments.