Economic Impacts of Efficiency Spending in Vermont: Creating an Efficient Economy and Jobs for the Future

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ABSTRACT

The success of energy efficiency programs is commonly reported in terms of net benefits and benefit-cost ratios for standard cost-effectiveness tests. While such metrics provide a powerful message, they do not speak to the overall impact of efficiency programs on the economy. Economic impacts of these programs include the effects of additional spending from participating households, increased production from participating businesses, and local business generated from demand for supporting equipment and labor, all mitigated by initial rate impacts of collecting funds to deliver the programs (depending on the funding mechanism). Expressing program impacts in broader economic terms such as gross state product and jobs created allows policy makers to make more informed decisions of where to direct limited public funding.

This paper reviews past analyses of the economic impacts of public efficiency programs, comparing their methodologies and results. We then report on a 2011 analysis of the economic impacts of Vermont's electric and fossil fuel efficiency programs. The study incorporated a multitude of economic drivers of efficiency programs, including sources and spending of funds (by economic industry), reduced utility bills for those purchasing efficient equipment, rate impacts due to reduced energy demand, and reduced obligations to the New England Independent System Operator. Recent efficiency potential studies and other data were used to develop inputs to the REMI economic model (Regional Economic Models, Inc.) to estimate job creation and the overall impact of efficiency spending on the State's economy. The paper concludes with recommendations for those considering such economic analyses in the future.

Introduction

An economic impact analysis assesses the effects of a policy, program, or project on the economy of a region, typically measured in terms of changes to economic output (e.g., gross state product), jobs, and/or income. In this paper we are concerned with the various approaches used to apply economic impact analysis to assess the economic impacts of energy efficiency (EE) programs. It is important to note the difference between economic impacts and benefits: *economic impacts* are the result of additional spending or production in a given area while *economic benefits* are a societal improvement such as productivity or savings. Therefore, in the context of EE programs, the savings that participants experience is an economic benefit while the additional spending and production (that derives from this savings) is an economic impact.

We begin with an overview of the economic impacts of energy efficiency programs, followed by a literature review of relevant studies. We then present a 2011 assessment of the economic impacts of Vermont's investment in EE programs, including some unique aspects not found in other similar studies.

Overview of Economic Impacts of Energy Efficiency Programs

Energy efficiency programs affect the economy of the region in which they operate in a wide variety of ways. To address these impacts we begin by identifying key market segments affected by efficiency programs (and the terminology used in this paper):

- *Utilities* that provide electric or natural gas service
- *Program Administrators (PAs)* that administer efficiency programs (often the utilities are the PAs)
- *Ratepayers* who pay for utility service and fund the efficiency programs
- *Program participants* who receive program incentives to implement efficiency measures
  - *Residential participants* include home and apartment owners and renters
  - *Business participants* represent all goods and services categories.[1]

Depending on how they are funded and operate, efficiency programs affect various cash flows between different segments of the economy. The main spending categories associated with the efficiency programs include:

- total spending for installed efficient equipment and practices (relative to the baseline of standard-efficiency equipment and practices), which include:
  - the “out-of-pocket” portion of those costs paid by participants, plus
  - the portion of those costs paid by the efficiency programs including any rebates or other incentives paid to program participants or vendors, and
- other program spending for administration, technical assistance, marketing, etc.

The economic impacts of those changes in spending depend on the extent to which they call on supporting industries in the region. Economic impacts derive from:

- *Direct impacts*, due to the immediate effects of direct spending on efficiency equipment and services
- *Indirect impacts*, due to spending on supporting goods and services by the contractors or vendors who receive direct payments for efficiency equipment and services
- *Induced impacts*, due to changes in spending by residents and businesses, enabled by their efficiency investments due to reduced energy costs.

In general, energy efficiency investments create net positive economic impacts in a given region. The reasons behind this are twofold. First, the portfolio of energy efficiency investments delivered by a program administrator are usually required by law to be “cost-effective” relative to alternative supply options, guaranteeing that they are net positive investments. That is, despite being expensed at the time of installation, over the lifetime of the investment, ratepayers save money relative to the alternative of purchasing supply. Those ratepayer savings, particularly participant savings, are then re-spent in the local economy. Second, energy efficiency spending

[1] For example, the categories of industries that appear in the North American Industrial Classification System (NAICS), which includes professional and administrative services, construction, manufacturing, etc.

tends to remain in the local economy more than "traditional" energy spending. Energy efficiency is a more labor-intensive activity than typical generation or delivery of fuel. Identifying opportunities, analyzing the costs and benefits, and designing/installing efficient equipment are all labor-intensive processes, much more so than operating a power plant or delivering fuel. Further, because these processes generally require on-site work, they are usually completed by a local contractor, creating more jobs in the region than would be lost by the activities they displace, such as electric generation, or spending on other goods and services rather than paying for more efficient equipment. These factors generally lead to positive net impacts in a region, although the size of the impacts will vary by region depending on how the region is defined, the amount of energy savings, and how much of the spending by each affected industry remains within that given region. Other aspects and nuances of economic impact modeling are described in more detail in the literature review below, and in the case study.

Literature Review

Based on a review of literature and our own experience in economic impact modeling, we have identified the following key decision points to consider when performing economic modeling for these programs. Some of these will also apply to the modeling process in general. We provide a summary of the studies reviewed in Table 1, further below.

Net vs. Gross Economic Impacts

Economic impacts are typically assessed as *net* impacts, meaning relative to not having EE programs (or not expanding existing programs). For example, an analysis of net impacts accounts for the impacts of increased spending on efficiency net of how those dollars would have been spent by ratepayers had they not been collected for the EE programs. However, some studies have assessed *gross* economic impacts, in which the spending that would have occurred in the absence of the EE program is ignored, as noted by Gardner & Skumatz (2007), and Imbierowicz & Skumatz (2004). Studies that assess only gross impacts do not fully account for impacts attributable to the EE program. All of the studies we reviewed were based on assessments of net impacts.

Static vs. Dynamic Economic Modeling

Static input-output economic models such as IMPLAN are popular for estimating economic impacts and indeed are useful for capturing spending relationships between industries and trade flows between regions (Geller & Goldberg 2009; Synapse 2009). These models are geared towards estimating the impact of an increase or decrease in an industry's *production* but are not well-equipped to handle the impacts of an industry's *savings* since they do not estimate how a business or household would spend as a reaction to this savings. Therefore, these models require the modeler to assume how savings will be re-spent by residents and businesses. In the absence of rigorous data available on how savings will be spent, it is reasonable to assume that residents and businesses will re-spend their net energy savings across their typical spending patterns.[2] As their name suggests, static models do not capture temporal changes or feedback from the local economy—such as "crowding out" of investments. Regarding temporal changes, modelers must account for these effects on their own if they choose to at all.

Dynamic economic models (e.g., REMI, REDYN[3]) forecast changes in the economy including assumptions for worker productivity and inflation (among others) that affect the economic impacts over time (Howland et al. 2009; PA & EDR 2010). Both REMI and REDYN are competitive general equilibrium (CGE) models, meaning that they account for adjustments of the economic system given a new stimulus activity. For instance, a business that saves on energy will become more competitive and thus draw more business from outside the region than it did previously. These models attempt to account for the ever-changing nature of the local economy, as opposed to static models that assume the status quo. Although these models do more "work" than static models, the added sophistication also means that the user has less flexibility available. Some modelers use a hybrid of the two. For example, ACEEE's DEEPER model is called "quasi-dynamic" since it incorporates changes in output per worker and energy costs each year, along with data from IMPLAN (Laitner, Eldridge & Elliot 2007).

Net Savings Over Time

Although many participants pay for the investments in efficiency over long periods of time, some studies assume that the investments are paid for up-front. For small purchases (e.g., light bulbs) this makes sense but for larger purchases (e.g., commercial boilers) most participants will not pay out-of-pocket but will amortize the expense by borrowing and making payments over time. This is important in capturing the timing of economic impacts since those participants that amortize these investments will not face a huge deficit but instead will pay small amounts over time and, depending on their energy savings, spend more or less over the years that they are paying off the investment (Geller & Goldberg 2009).

Re-Spending by Businesses

Many studies that use static input-output models do not properly account for the re-spending by businesses that participate in efficiency programs. Studies tend to focus on the re-spending of residential participants and either ignore business re-spending or treat it similarly to household re-spending. Residential re-spending will tend to be on household goods while businesses should see wider profit margins and thus invest in other factors of production (capital, labor or other materials). One study in Washington estimated the energy cost elasticity for businesses (i.e. the sensitivity of production to energy costs) and applied the energy savings to this factor to arrive at increases in production as inputs for the IMPLAN model (Grover 2010).[4] Although more study is required to see how businesses react to energy savings, an attempt

[2] This depends on the funding mechanism for the program. Our study focuses on ratepayer funded programs but if a program were to be taxpayer funded, then the "base case" should assume that taxpayer funds are being spent elsewhere. In other words, the taxes to pay for the EE program would be displacing other government spending.
[3] The REMI model is described later in this paper. For the REDYN model see http://www.redyn.com/.
[4] Elasticity measures the percentage change in one variable divided by the percentage change in another in order to show the sensitivity between the two. For instance, in the Washington study, the authors estimated an elasticity of -.81 for "energy intensive industries," meaning that if energy costs decreased by 10% then production at these industries would increase by 8.1%.

should be made to account for these savings in a separate manner from household savings. Dynamic, CGE models like REMI make it easier to address this issue by treating industry savings as separate inputs and differentiating by type of savings (Howland et al. 2009).

Local vs. Non-Local Activity

An important consideration for economic impact modeling is determining the percentage of labor and equipment that will be provided "locally"—meaning within the study area. A mistake sometimes made is to assume that 100% of the goods and services of a project are provided locally, either deliberately or as a result of the default settings of certain models. The activities of increased supplies in the local area are a critical component for estimating indirect effects. For energy efficiency projects, it is reasonable to assume that a large share of the labor will be local if the area encompasses a large labor market such as a state or metropolitan area. It is more difficult to determine the extent to which efficiency equipment will be produced locally since the projects will be scattered throughout the region. This challenge is unique to energy efficiency since many economic impact studies deal with large investments that take place at one site, making it easier to handle these modeling decisions. As a starting point, the modeler needs to determine the industries that will be called upon. A study by Lawrence Berkeley National Laboratory provides useful data on the types of equipment and associated employment for efficiency measures (Goldman et al. 2010).

Inclusion of Non-Energy Impacts

Non-Energy Benefits, or more generally Non-Energy Impacts (NEIs), of EE programs may include, for example, operation & maintenance (O&M) impacts, water savings, productivity increases, and reduced costs for environmental damage or health care. NEIs that result in increased (or decreased) spending can be included in an economic impact analysis.

Some NEIs are relatively easy to quantify with reasonable accuracy, such as O&M and water impacts, while others such as worker productivity and improve health impacts can be quantified but with less accuracy or confidence. Because the value of NEIs can be large relative to the benefits of energy savings, they can be a significant component of the economic impacts. The studies we reviewed are not always clear as to whether and which NEIs have been included, which is a shortcoming to comparing their results. Oppenheim and MacGregor (2008) was an exception, as it reported the specific number of jobs created due to environmental improvement, and from other NEIs (including reduced costs for fire damage, crime, health care, moving due to evictions, and "other benefits").

Job creation and increased income attributed to EE programs can also be considered a NEI. Imbierowicz & Skumatz (2004) do so, and estimate that the value of these economic NEIs can vary more than 200% depending on the underlying assumptions.[5]

[5] While we find it appropriate to include these economic NEIs in an analysis of this type, their use should be considered carefully in other venues. For example, under societal cost-effective screening it may not be appropriate to count job creation as a NEI, as jobs may be lost outside of the region being analyzed that will not show up in the results, even though they are part of a broad definition of 'society'. Regulators will need to determine their definition of the limits of 'society' when applying the test.

Summary of Economic Impact Assessments of Efficiency Programs

Table 1 below provides a summary of a representative sample of the studies reviewed for this paper. These studies report widely differing results due to a variety of factors. Different regions with different economies are expected to have differing results. For example, a region that generates its own electricity will have different economic impacts due to electric savings than a region that imports its electricity. In addition, the modeling methodology and assumptions can also affect the results. For example, the degree to which non-energy impacts (NEIs) are included, if at all, can have a large effect on the outcomes. Other factors that may or may not be accounted for, and thus affect the results, include rate impacts and price suppression due to reduced demand.

Different types of models (static or dynamic) presumably also affect the findings of such economic impact assessments, though we do not have enough data to gauge how substantial that may be. Dynamic models may be better suited to analyses that extend over multiple years, in particular, given their ability to account for adjustments to the economic system over time and better account for price effects. Static input-output models may be limited in their ability to account for the considerable, cumulative economic impacts of EE programs over multiple program years. Many of the studies reviewed were limited to a single year of EE investment, whereas the economic impacts of EE programs over time may be greater than the sum of their individual year impacts. We recommend additional research in this area.

Economic Impacts of Vermont's Electric and Fossil Fuel Efficiency Programs

Efficiency Vermont, the nation's first state-wide energy efficiency utility, has been operating since 2000. In addition, Efficiency Vermont is in the initial phases of providing efficiency services for non-regulated fuels, primarily oil and propane.[6] In 2011, Vermont's Department of Public Service contracted a study to assess the economic impacts of these EE programs (Optimal Energy and Synapse Energy Economics 2011). This section provides a brief overview of that study methodology; see the full report for greater detail on both the methodology and results.

[6] Natural gas EE programs are administered by the gas utility, and were not included in this study.

Table 1. Summary of Studies Reporting Economic Impacts of Efficiency Programs

Study Citation	Region	Model Type (Brand)	Efficiency Program Type(s)	Includes NEIs	Jobs per $Million	Study Period	Notes
PA & EDR 2010	Wisconsin	CGE (REMI)	Electric, Gas	Yes	75–250 job-years	25 years	Reported job-years vary widely by program type
Gardner and Skumatz 2007	Entire U.S. and individual states	I-O (not specified)	Electric	Yes	8–16 jobs	Multiple periods	Focus on NEI multipliers by program type (weatherization, new construction, and appliances).
Geller & Goldberg 2009	Colorado	I-O (IMPLAN)	Electric, Gas	No	17 jobs for electric, 12 jobs for gas	19 years	Separately assesses impacts due to codes & standards. Does not include EE savings past 2025. Jobs are from cumulative impacts in 2025.
Howland et al. 2009	New England	CGE (REMI)	Electric, Gas, Other Fuels	No	46–66 job-years	15 years	Job years/$1M: 46 for electric, 50 for gas, 66 for unregulated fuels.
Imbierowicz & Skumatz 2004	Entire U.S. and individual states	I-O (IMPLAN)	Low-income weather-ization	Yes	16 jobs	1 year	
Oppenheim & MacGregor 2008	Entergy territory in Ark., La., Miss., and Tex.	I-O (see notes)	Low-income weather-ization	Yes, extensive	216 jobs	1 year	Used Regional Input-Output Modeling System (RIMS II) multiplier tables maintained by the U.S. Bureau of Economic Analysis.
Optimal Energy and Synapse 2011	Vermont	CGE (REMI)	Electric, Unregulated Fuels	Yes	43 job-years	20 years	NEI's include O&M and water impacts.

Model Type: Input-Output (static) or Competitive General Equilibrium (dynamic)

Includes NEIs: Non-Energy Impacts (NEIs) may include Operation & Maintenance impacts, environmental or health benefits, productivity increases, etc.

Jobs per $1M: Jobs created per $1 million spent on each type of EE program, rounded to the nearest whole number. Studies generally report either the actual number of jobs after a given number of years, or the job-years (full time job for 1 year) that will be created over the life of the program impacts. Actual jobs cannot be compared well to job-years.

Regulatory Perspective

Because cost-effective energy efficiency (EE) resources are less expensive than generating and delivering electricity from a societal perspective, Vermont utilities are required to acquire all reasonably available cost-effective efficiency as part of "least cost" integrated resource planning.7 The responsibility for acquiring this efficiency has been delegated to Efficiency Vermont by the Public Service Board; the Board also determines what amount of efficiency is "reasonable." Triennial proceedings to determine budgets in Vermont often include significant debate related to the initial rate impact of efficiency investments (which are expensed immediately but provide benefits over the lives of efficiency measures), and the overall economic impact in Vermont. For example, in proceedings determining the 2012-2014 energy efficiency budgets, certain stakeholders advocated for flat or reduced efficiency budgets, citing bill increases for non-participants as having a negative impact on the local economy in comparison to other states. At the time, the Department of Public Service had at its disposal only older economic impact studies from other states (which do not necessarily have the same economic situation as Vermont) along with qualitative arguments describing why the economy benefits from energy efficiency investment.

While the evidence provided to the Board was ultimately used as a basis for budget setting in the recent Board proceeding, the process underscored the need for a rigorous economic study that quantified the impacts of efficiency investment on Vermont's economy. The Department of Public Service understood that robust analysis of economic impacts of efficiency, based on inputs related to the Vermont economy, would clarify the uncertainty resulting from qualitative assessments and secondary information. In addition to the value in Public Service Board budget-setting proceedings, the report was commissioned to serve as an educational tool whenever energy efficiency charge collections are considered for meeting other general obligations of the State.

Methodology and Data Sources

The study used the PI+ model developed by REMI (Regional Economic Models Inc.) to estimate the economic impacts of Vermont's EE programs. This is a dynamic model, as described above in the literature review. REMI has built-in baseline forecasts of economic activity that are calibrated to each study region (in this case the State of Vermont). Changes to economic activity represent "policy changes" that affect the trajectory of the state economy—in this study this includes changes to consumer spending, businesses' energy costs, and additional commercial activity and industry demand related to energy efficiency investments.

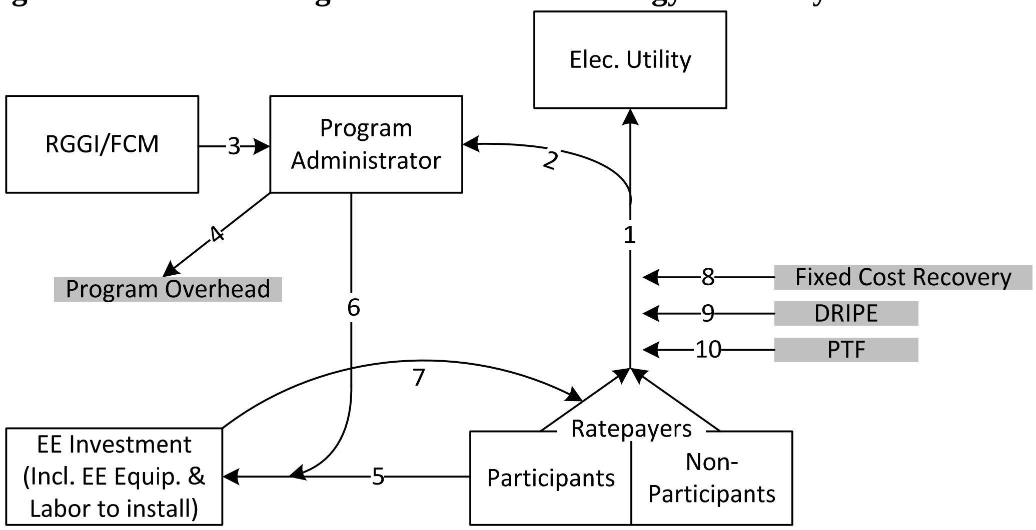
The primary model inputs related to electric EE were derived from a detailed, measure-level, Vermont efficiency potential study developed in the spring of 2011. The energy impacts and associated costs were available by sector (residential, commercial, industrial), program, and measure. The basis of the economic analysis for the unregulated fuels EE program was a program plan for that new initiative, also completed in 2011. The energy savings projected by these studies were multiplied by average retail rates to determine end-user net benefits. They were also used to determine the total reduced supply requirements for the utilities.

[7] 30 V.S.A. 209(d)

Cash Flows Captured in the Model

The 2012 program year of energy efficiency investments were modeled in REMI as transfers of money from one party to another (from ratepayers to various industries in and out of state), whereas savings due to investments were modeled as increased discretionary spending for residents and lower energy costs for businesses that participate. The benefits due to saved energy and economic impacts were evaluated over a 20-year period. Figure 1 represents the various cash flows and how they relate, with explanations provided below the figure.

Figure 1. Cash Flow Diagram of Vermont's Energy Efficiency Investment



1. Payments by electric ratepayers via their electric bills.
2. The surcharge on electric bills to fund electric EE programs.
3. Allowance auction revenues provided the unregulated fuels program from the Regional Greenhouse Gas Initiative, and revenue provided to the Program Administrator for demand resources from the Forward Capacity Market.
4. Payments to the Program Administrator for program administration, core supporting services, and other non-incentive costs of EE program delivery.
5. Incremental cost of EE equipment, above the cost of baseline equipment.
6. Incentives from the PA to reduce market barriers to EE investments.
7. EE equipment reduces energy consumption, lowering utility bills over the lives of the efficiency measures.

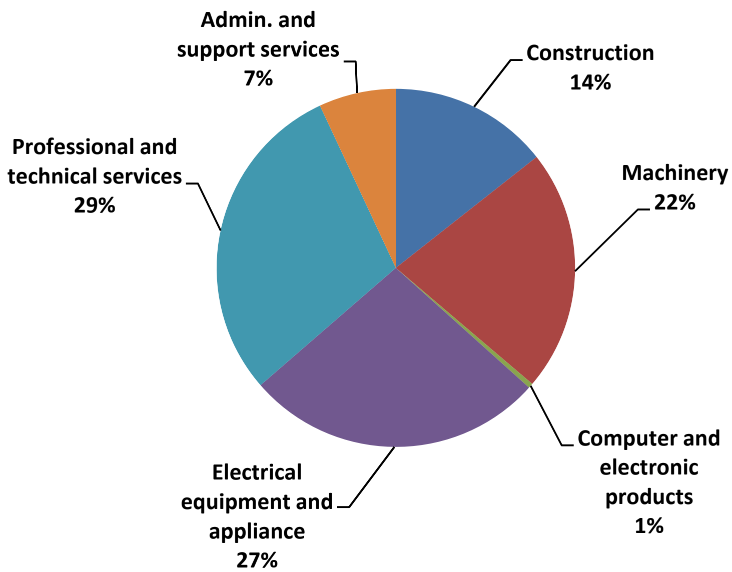
Items 8, 9 and 10 impact electric rates due to reduced electric consumption:

8. Impacts in electric rates due to fixed cost recovery, since they are not supplying as much electricity.
9. Reductions in customer electric rates due to Demand Reduction Induced Price Effects.[8]
10. Reductions in customer electric rates due to Vermont's reduced contributions to Pooled Transmission Facilities and ancillary services provided by the New England Independent System Operator.

[8] These price-suppression effects were included in the regional avoided cost study (Synapse 2009).

Program and participant spending create a stimulus in the local economy that is felt by a handful of industries, namely those associated with energy efficient equipment and its installation. The magnitude of the impact felt by each industry depends on the total incremental cost associated with a given industry's corresponding equipment/services, and the amount purchased. The mapping of equipment and labor categories to REMI industries was conducted on a program-by-program basis since the portion of the incremental cost due to labor was most easily estimated by program (e.g., labor costs were estimated to be near 0% for retail products programs, but upwards of 30% for the low-income program). Figure 2 shows the resulting proportion of the total investments going to each industry.

Figure 2. Distribution of Program and Participant Spending by Industry



Net Positive Economic Impacts from Efficiency: 1900 job-years, 5:1 Return on Investment

Table 2 shows the resulting net economic impacts (i.e. economic activity over and above what would have happened without the program) in terms of job-years of employment, personal income, Gross State Product, and output (i.e., business sales). Program operations for the year 2012 are estimated to generate a net increase of nearly 1,900 job-years[9] and $220 million in Gross State Product in Vermont over 20 years. The largest impact year is 2012 itself, since this is when new equipment and installation are purchased. However, we assumed that a portion of the participants finance their investments and pay them off over the loan term. In the following years, positive net benefits continue due to energy cost savings to participants and price effects that occur for all ratepayers.

[9] A job-year is the equivalent of full-time employment for one year. For instance, 20 job-years could represent one job over a 20 year period or any such multiplication of years and jobs that equal 20.

Table 2. Total Economic Impacts of Vermont Energy Efficiency Programs (2011$)

Impact Type	2012			2012-2031		
	Elec.	Unreg. Fuels	Total	Elec.	Unreg. Fuels	Total
Jobs (job-years)	305	65	370	1,808	85	1,894
Personal Income (million)	$11	$2.5	$14	$96	$1.9	$98
Gross State Product (million)	$12	$2.2	$14	$215	$4.7	$220
Output (million)	$17	$5.0	$22	$344	$7.0	$351

Table 3 presents the impacts as value produced per dollar of program spending for the planned 2012 energy efficiency program budget of $44.4 million (in 2011$). Even in a state with mature programs resulting from significant and sustained investment in energy efficiency, a one-year investment creates a net gain of 43 job-years per million dollars of program spending and a net increase of nearly five dollars of cumulative Gross State Product for every dollar spent. For every dollar of program spending, an additional two dollars is generated in Vermonters' income over 20 years. The unregulated fuels program exhibits lower impacts per dollar than the electric program since less of the associated equipment is produced in-state and its energy savings are relatively small. In terms of gross energy savings, the programs create over six dollars for every dollar spent on the program. These impacts take on more significance when we consider that Vermont's energy efficiency programs will continue to operate for multiple years, compounding these impacts.

Table 3. Leverage of Program Spending

Program Spending Metric	Electric	Unreg. Fuels	All
Total Budget (million, 2011$)	$39.1	$5.3	$44.4
Job-years per million	46	16	43
$Gross State Product/$Budget	5.5	0.9	5.0
$Personal Income/$Budget	2.5	0.4	2.2
$Energy Savings/$Budget[10]	6.6	2.7	6.1

Conclusions

The literature review shows that different studies of the economic impacts of EE programs have widely varying results. These differences can be due to modeling assumptions and methodologies as well as the economic differences between study areas. The differences in methodology make it difficult to compare the results of different studies. We recommend that economic impact studies of EE programs clearly identify what is included in addition to the benefits of energy savings, and that the impacts of NEIs be reported separately from the energy impacts and, as feasible, by multiple categories of NEIs. We also recommend additional research

[10] If the energy savings and program budget were discounted at a real rate of 5.6% (as used in Vermont at the time for EE investments), these ratios would be 4.6 for electricity, 1.6 for unregulated Heating and Process fuels, and 4.2 collectively.

on the consequence of using different types of models (static vs. dynamic) given their differences in being able to account for cumulative, compounding economic impacts over time.

Regardless of the range of estimates of job creation, gross state product, and income between different studies, these assessments are essential for providing a measure of the broader economic impacts of EE programs. All studies have indicated significant economic impacts, yet these are often overlooked as justification for public investment in efficiency. It is well worth refining and expanding the practice of assessing the economic impacts of EE programs, so that they are well understood and used to inform policy decisions, and so that opportunities for programs beneficial to society will not be missed in the future.

As noted above, this study showed that energy efficiency investments in Vermont continue to provide significant positive net impacts to the state's economy: a net present value of over 4.6 times the investment for electric efficiency investments, and 1.6 times the investment for unregulated heating and process fuel efficiency investment. Combined, the investments planned for 2012 are expected to add a net of nearly 1900 job-years to the Vermont economy. These results were consistent with those found in the literature review. The results were unequivocal: energy efficiency, in addition to being good for ratepayers, is good for Vermont's economy. The Department of Public Service appended this economic analysis to its Comprehensive Energy Plan (Vermont Department of Public Service 2011), and used it to help justify plans for continued measured increases in efficiency investment for both the electric and heating and process fuels. In addition, the report provides further insulation from would-be raids of efficiency funds. It validated the positions put forth by the Department of Public Service and other stakeholders in the recent budget proceedings, and results will be a consideration in future budget proceedings. These types of area-specific economic analyses are important in furthering understanding of efficiency investment's broad impacts to the economy.

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