Energy Efficiency: Engine of Economic Growth

A Macroeconomic Modeling Assessment

Executive Summary

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Authors:
Jamie Howland & Derek Murrow, ENE
Lisa Petraglia & Tyler Comings, Economic Development Research Group, Inc.

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Any errors, omissions or opinions expressed in this report are the responsibility of ENE alone.

To contact the authors directly:

Derek K. Murrow, Director, Energy and Climate Policy: 203-285-1946, dmurrow@env-ne.org

Jamie Howland, Policy Analyst: 860-246-7121, jhowland@env-ne.org

About ENE

ENE (Environment Northeast) is a non-profit organization that researches and advocates innovative policies that tackle our environmental challenges while promoting sustainable economies. ENE is at the forefront of state and regional efforts to combat global warming with solutions that promote clean energy, clean air and healthy forests.

Headquarters 8 Summer Street, POB 583, Rockport, ME 04856, 207-236-6470
www.env-ne.org | admin@env-ne.org | Daniel L. Sosland, Executive Director

Massachusetts: 101 Tremont Street, Suite 401, Boston, MA 02108, 617-742-0054

Rhode Island: 203 S. Main Street, Providence, RI 02903, 401-474-8876

Connecticut: 21 Oak Street, Suite 202, Hartford, CT 06106, 860-246-7121

Canada: 126 Richmond Street, Charlottetown, PE, C1A 1H9, 902-628-1493

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Energy efficiency is emerging as a key policy solution to address high energy costs and the threat of climate change. As investments in energy efficiency programs increase, there is a need to understand economic effects on individual program participants and on the economy as a whole. While microeconomic benefits to ratepayers and program participants are analyzed and verified through public program design processes, less is known about macroeconomic benefits of efficiency investments.

This study quantifies macroeconomic impacts of increased energy efficiency investments in New England, where efficiency has assumed a leading role in energy policy. Several New England states have increased efficiency investments significantly in recent years, and others are planning dramatic funding increases. As decision makers nationwide consider energy policy reform, New England's increasing focus on efficiency provides a prime case-study for evaluating efficiency's impact on economic output and job growth.

The study utilizes a multi-state policy forecasting model by Regional Economic Models, Inc. (REMI) to project macroeconomic impacts of expanded efficiency programs in comparison to a scenario where no programs exist. The study analyzes efficiency programs for electricity, natural gas, and "unregulated fuels," (fuel oil, propane, and kerosene), using very conservative estimates of investment levels needed to capture all cost-effective efficiency (efficiency that is lower cost than supplying additional energy). The investment levels modeled are significantly higher than present program budgets in most New England states, but two states (MA and CT) have recently proposed efficiency budgets that approach investment levels needed to capture all cost-effective efficiency. State efficiency program budgets were modeled to ramp up to the levels shown in Table ES1 below.

Table ES1: Modeled Efficiency Program Investment Targets

State	Annual Target Investment Level ($2008 Millions)			
	Electric	Natural Gas	Unregulated Fuels	Total
Connecticut	259	66	108	432
Maine	92	5	75	172
Massachusetts	475	158	131	763
New Hampshire	92	14	45	151
Rhode Island	67	26	24	117
Vermont	50	5	25	80
Six State Total	1,034	272	409	1,715

Modeled scenarios relied on representative efficiency programs for each fuel type, using assumptions about costs and savings for program measures in each market segment. Assumptions were based on data from current programs as well as program expansion proposals and state-level cost-effectiveness studies. Assumptions were also informed by discussions with program administrators and experts in the field of energy efficiency. Expanded efficiency programs were modeled over 15 years, and funding ramp-up periods were incorporated to reflect sustainable program growth rates. The model continues for another 20 years to capture the economic benefits achieved over the life of efficiency measures.

In order to investigate the complementary nature of efficiency programs across jurisdictions, two scenarios were modeled for each fuel: first where each state acts alone (the "individual" scenario); and second where all New England states implement at once (the "simultaneous" scenario). In all cases simultaneous action resulted in greater economic benefits to the region, as energy savings improved states' relative national competitiveness and increased trade among states and with the rest of the world.

Benefits from increased efficiency investments in New England are significant for each fuel type. Increasing efficiency program investments in all six states to levels needed to capture all cost-effective electric efficiency over 15 years ($16.8 billion invested by program administrators) would increase economic activity by $162 billion (2008 dollars),[1] as consumers spend energy bill savings in the wider economy. Sixty-one percent of increased economic activity ($99 billion) would contribute to gross state products (GSPs) in the region, with $73 billion returned to workers through increased real household income and employment equivalent to 767,000 job years (one full-time job for a period of one year). Over 15 years, increased natural gas efficiency ($4.1 billion invested by program administrators) would increase regional economic activity by $51 billion, boost GSPs by $31 billion, and increase real household income by $22 billion while creating 208,000 new job years of employment. Unregulated fuels efficiency programs ($6.3 billion invested by program administrators) would increase regional economic activity over 15 years by $86 billion, boosting GSPs by $53 billion, and increasing real household income by $37 billion while creating 417,000 job years of new employment.

The macroeconomic benefits of efficiency derive from changes in the economy that occur as a result of increased spending on efficiency measures and decreased spending on energy. The majority of these impacts (81-91%) result from the energy savings realized by households and business. Lower energy costs cause other forms of consumer spending (such dining out or discretionary purchasing) to increase. Lower energy bills reduce the costs of doing business in the region, bolstering the global competitiveness of local employers and promoting additional growth.

The effectiveness of efficiency investments can be evaluated by considering economic benefits relative to efficiency program dollars invested. The following table shows the absolute and relative economic benefits of the simultaneously-modeled energy efficiency investments for all six New England states.

Table ES2. Summary of New England Economic Impacts

	Electric	Natural Gas	Unregulated Fuels
Total Efficiency Program Costs ($Billions)	16.8	4.1	6.3
Increase in GSP ($Billions)	99.4	30.6	53.1
Maximum annual GSP Increase ($Billions)	5.6	1.8	2.9
Percent of GSP Increase Resulting from Efficiency Spending	12%	11%	9%
Percent of GSP Increase Resulting from Energy Savings	88%	89%	91%
Dollars of GSP Increase per $1 of Program Spending	5.9	7.4	8.5
Increase in Employment (Job Years)	767,011	207,924	417,061
Maximum annual Employment Increase (Jobs)	43,193	12,907	24,036
Percent of Employment Increase from Efficiency Spending	16%	15%	12%
Percent of Employment Increase from Energy Savings	84%	85%	88%
Job-Years per $Million of Program Spending	46	50	66

[1] 2008 is the dollar year basis for all figures unless otherwise indicated.

The modeled results of increased efficiency investments show that efficiency provides significant economy-wide benefits in addition to direct participant savings, upon which efficiency programs are often justified. Expanding analysis from micro-level, cost-benefit tests to macro-level assessments of the economic impacts of efficiency (including losses to electric generators and fuel suppliers) clearly illustrates that investing in energy efficiency is one of the most effective means of improving economic conditions widely, while saving consumers money and reducing emissions.

This study illustrates that the economic benefits of energy saved through efficiency programs supplement and exceed the impacts of spending on implementing efficiency measures, and that efficiency investments quickly pay for themselves through increased economic activity and job creation. New England is not unique in terms of availability of efficiency resources; cost-effective efficiency savings can be found in any energy system. However, to capture the economic benefits of efficiency, policies must be created that include programs and incentives to overcome initial costs and deliver lasting benefits. This report shows that the benefits are greater than commonly recognized even by program administrators and proponents.

The total energy savings and reduced greenhouse gas emissions associated with the modeled levels of efficiency investments are also very significant. The following table illustrates these savings.

Table ES3: Summary of New England Energy Saved and Greenhouse Gas Emissions Avoided

	Electric	Natural Gas	Unregulated Fuels
Energy Savings	**(GWh)**	**(TBTU)**	**(TBTU)**
Maximum annual savings	35,100	92	119
Maximum savings vs. Business as Usual	26%	21%	28%
Lifetime savings (15 years of programs)	489,300	1,173	1,439
Equivalent GHG Emissions Avoided	**(Millions short tons)**	**(Millions short tons)**	**(Millions short tons)**
Maximum annual avoided emissions	17.6	5.4	8.9
Maximum annual avoided emissions vs. 2005 total New England Emissions	8.3%	2.5%	4.2%
Lifetime avoided emissions (15 years of programs)	287	91	158